Anne Weymark

Eastbourne

A Present from her Uncle

Edward Weymark

Royal Artillery

July

1852

THE

CRYSTAL PALACE,

AND ITS CONTENTS;

BEING

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF THE INDUSTRY OF ALL NATIONS.

1851.

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The CRYSTAL PALACE AND ITS CONTENTS

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

INTRODUCTORY ADDRESS.

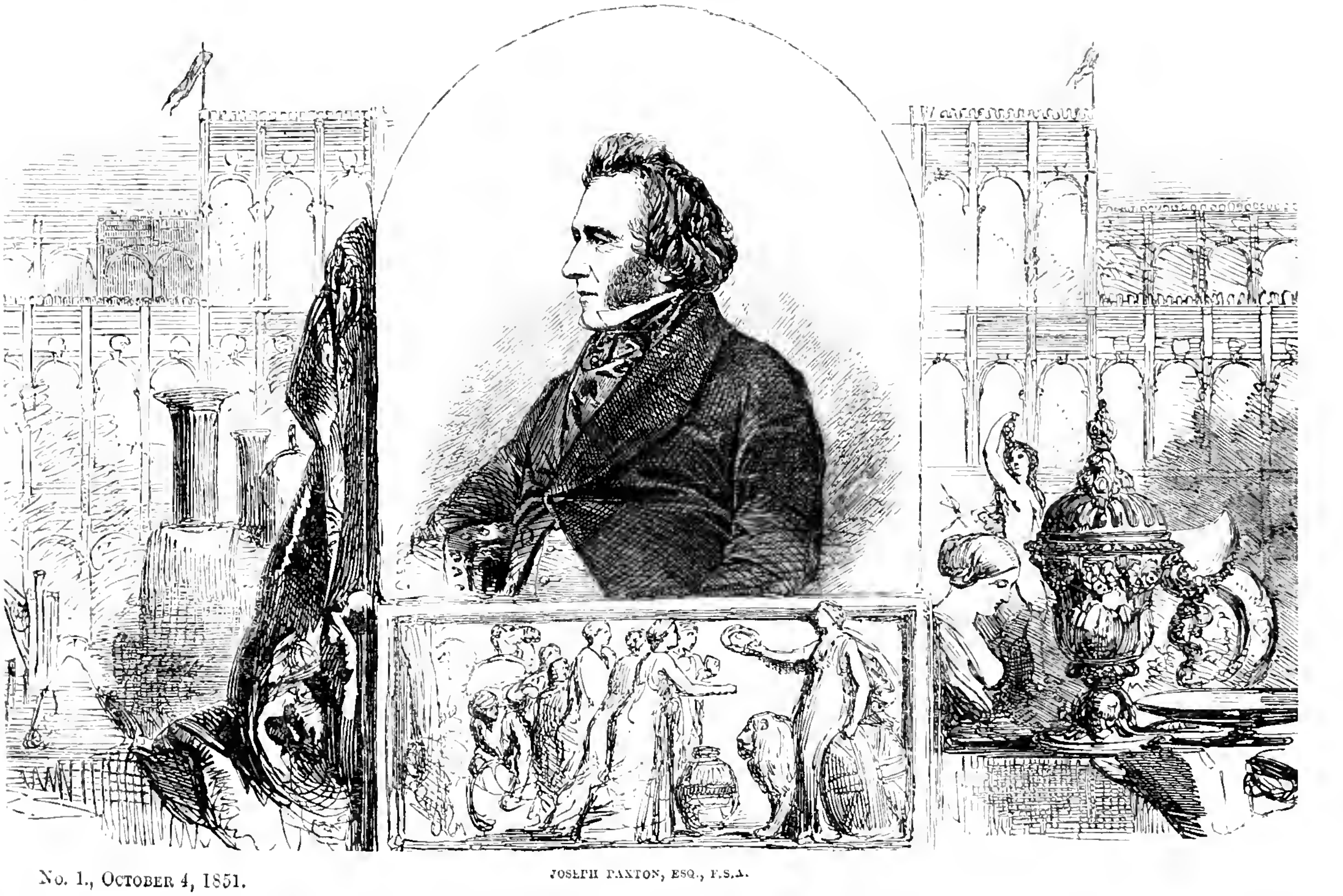
THE Great Industrial Exhibition of 1851, now on the eve of closing, is an achievement, the beneficial effects of which are not for our own day only, but "for all time." That congress of the highest practical and speculative intelligences of the various nations of the world, that vast assembling of natural products, of mechanical appliances, and of manufactured goods from all quarters of the globe, must have led to a reciprocation of individual experiences, an interchange of thought, which must add largely to the general store of knowledge, and an acknowledgment of relative commercial interests which cannot but promote the common weal of the whole human community.

In this great mart of intelligence and wealth, the poorest of our fellows share equally, perhaps more largely, in proportion, than the richest in the land; for it is by the stimulus thus given to the energy and enterprise of the world that they must hope to improve their condition, and rise in the scale of society. And have not the millions who have flocked from the extremest end of the land to this great industrial gathering shown that they rightly appreciated its general importance; and have not their scrutinising inquiries in various departments, each according to his calling or views, proved that they were determined to make the most of the valuable opportunities it afforded them.

Yet, the advantages intended to society, through this great undertaking, will mainly depend upon the Record which is kept of important facts eliminated, and the valuable examples presented to observation. This record does not exist at present; and it is with a view to supply a desideratum which so obviously presents itself, and to perpetuate to the use of the intelligent and industrious millions all the more important facts and features of the world's industrial fair, of scientific, as well as social bearing, that the present work is projected. "The CRYSTAL PALACE" will contain well-digested accounts of all matters of enduring interest comprised in that great display, copiously illustrated with engravings, and published at a price which will place it within the reach of all readers.

In order to render the work a complete record of this important, artistic, and scientific gathering, a Historical Sketch will be given, taking a complete review of all the events connected with the progress and accomplishment of this great National undertaking; from the first inchoate suggestion in 1845, to Prince Albert's definite proposition in 1849, down to the final closing of the doors, and the adjudication of prizes in October, 1851.

The subjects will be classified in groups as far as practicable, which will be continued under their several distinct heads from time to time, care being taken, however, to provide sufficient variety in each number. On the completion of the work an index will be given, which will render it available as a Cyclopædia of Science, Arts, and Productions in 1851.



No. 1., OCTOBER 4, 1851.

JOSEPH PAXTON, ESQ., F.S.A.

HISTORY OF THE GREAT EXHIBITION.

I. Preliminary Movement.—Appointment of the Royal Commission.

"THE Great Exhibition of the Works of Industry of all Nations, 1851," will stand recorded in the annals of future ages as the first event of the kind which has occurred in the history of man. We say the first event "of the kind," for, although many expositions of industrial productions have been held from time to time in various other countries, and also recently in some of our own cities, they have always been restricted to the works of the particular nations, or localities, to the exclusion of the rest of the world. Furthermore, it may be added, that expositions, regulated by these principles, were in reality little else than large fairs, where the immediate extension of individual commercial dealings was the main object held in view.

England, then, has been the first not only to throw open her own shop for the inspection of all the world, but to invite all the world to compete with her in it, and that in every walk and department of business. It was a bold, a courageous, a generous step; and although in the working out of the details, and in some of the accidental incidents inseparable from all great undertakings, she may not fancy herself adequately requited, upon the whole, we do not think she will have reason to repent what she has done.

We will now briefly trace the history of the events which led to this undertaking: an undertaking, the honour of which, we must state at the outset, is mainly attributable to the Society of Arts of London. As early as the years 1756—7, the Society of Arts of London offered prizes for specimens of manufactures, tapestry, carpets, porcelain, &c., and exhibited the works which were offered in competition; and about the same period, the Royal Academy had organised its exhibitions of paintings, sculptures, and engravings.

The first exhibition of industrial productions in France, occurred in 1789, being confined to Gobelins tapestry and Sèvres china, exposed for sale for the benefit of the workmen who were in a distressed condition; the next in 1798, which included sumptuous furniture and other articles of *luxe*: the next in 1801, a fourth in 1802, and a fifth in 1806. But it was not till the restoration in 1819, that the expositions of French industry began to take place systematically, and to include that larger and more varied class of objects adapted to the requirements and means of the masses. The eleventh and last great exposition took place in the Champs Elysées in 1849, (the previous one having taken place in 1844,) in a building erected for the purpose, which covered more than five acres of ground, and in which the productions of 4494 exhibitors were displayed. The Bavarians and the Belgians have of late years imitated the example set by France, and with good success. Manchester, Leeds, Birmingham, Dublin, and other towns have also held similar exhibitions, being more properly styled bazaars; and in 1845, the great Free Trade Bazaar was held at Covent Garden theatre, which was open twelve days.

We now come to trace what led to the infusion of a more cosmopolitan principle in these exhibitions, so signally exemplified in the Great Exhibition which has just closed. As early as 1845, in consequence of the good success which had attended the Paris Exhibition of the preceding year, the Society of Arts made some efforts to move our Government to promote or favour a somewhat similar exposition in this country, but without success. Governments are always slow to "move on;" and there being no precedent for such a proceeding in the books of the Treasury, how could they be supposed capable of doing anything in the matter? Even so late as the year 1848, a proposal to establish a self-supporting Exhibition of British Industry, to be controlled by a Royal Commission, was submitted to Prince Albert (then President of the Society of Arts), and by him laid before the Court; but again without leading to any result. Meantime, however, the Society of Arts had begun to substitute action tor theory, example for persuasion:—

"In 1847 (we quote from the introduction to the Official Catalogue) the Council of the Society substituted action for theory, and, in the midst of discouragement, established a limited exhibition of manufactures, professedly as the beginning of a series. The success of this exhibition determined the Council to persevere, and to hold similar exhibitions annually. Accordingly in the next year the experiment was repeated with such greatly increased success, that the Council felt warranted in announcing their intention of holding annual exhibitions, as a means of establishing a quinquennial Exhibition of British Industry, to be held in 1851. Having proceeded thus far, the Council sought to connect the Schools of Design, located in the centres of manufacturing industry, with the proposed exhibition, and obtained the promised co-operation of the Board of Trade, through the President, Mr. Labouchere; moreover, with a view to prepare a suitable building, they secured the promise of a site from the Earl of Carlisle, then Chief Commissioner of Woods and Forests, who offered either the central area of Somerset House, or some other Government ground. In the year 1849, the exhibition, still more successful than any preceding, consisted chiefly of works in the precious metals, some of which were graciously contributed by her Majesty. To aid in carrying out their intention of holding a National Exhibition in the year 1851, the Council of the Society caused a report on the French Exposition, held in 1849, to be made for them and printed. A petition was also presented by the Council to the House of Commons, praying that they might have the use of some public building for the exhibition of 1851, which was referred to the Select Committee on the School of Design."

It should be stated that, in February, 1849, M. Buffet, the French Minister of Agriculture and Commerce, addressed a circular to the Chambers of Commerce of France, proposing that specimens of skill in agriculture and manufactures from neighbouring nations should be admitted to this approaching exposition, and asking the opinion of the manufacturers upon the subject. The answer he received, however, was not favourable, and he abandoned the idea; and it was this very circumstance, probably, which forced upon the Society of Arts, with Prince Albert at their head, the conviction that this wider and more generous field was the one they must adopt, if they would enlist the sympathies of the world in their project, and render it commercially self-supporting and independent.

His Royal Highness the Prince Albert, as President of the Society, had of course been fully informed, from time to time, of all these proceedings, which had received his Royal Highness's sanction and approval; but immediately after the termination of the session of 1849, the Prince took the subject under his own personal superintendence. He proceeded to settle the general principles on which the proposed exhibition for 1851 should be conducted, and to consider the mode in which it should be carried out.

On the 29th June, 1849, the general outlines of the Exhibition were discussed by his Royal Highness: and from that day to the present time, accurate accounts of all proceedings have been kept, and the greater part of them printed and published. The minutes of a meeting of several members of the Society of Arts, held at Buckingham Palace on the 30th June, set forth as follows:—

His Royal Highness communicated his views regarding the formation of a Great Collection of Works of Industry and Art in London in 1851, for the purposes of exhibition, and of competition and encouragement.

His Royal Highness considered that such Collection and Exhibition should consist of the following divisions:—

Raw Materials.
Machinery and Mechanical Inventions.
Manufactures.
Sculpture and Plastic Art generally.

It was a matter of consideration whether such divisions should be made subjects of simultaneous exhibition, or be taken separately. It was ultimately settled that, on the first occasion at least, they should be simultaneous.

Various sites were suggested as most suitable for the building; which it was settled must be, on the first occasion at least, a temporary one. The Government had offered the area of Somerset House; or if that were unfit, a more suitable site on the property of the Crown. His Royal Highness pointed out the vacant ground in Hyde Park on the south side, parallel with, and between, the Kensington drive and the ride commonly called Rotten Row, as affording advantages which few other places might be found to possess. Application for this site could be made to the Crown.

It was a question whether this Exhibition should be exclusively limited to British industry. It was considered that, whilst it appears an error to fix any limitation to the productions of machinery, science, and taste, which are of no country, but belong, as a whole, to the civilised world, particular advantage to British industry might be derived from placing it in fair competition with that of other nations.

It was further settled that, by offering very large premiums in money, sufficient inducement would be held out to the various manufacturers to produce works which, although they might not form a manufacture profitable in the general market, would, by the effort necessary for their accomplishment, permanently raise the powers of production, and improve the character of the manufacture itself.

The rest of the minute relates to the proposal for forming a Royal Commission to carry the project into effect; and the organisation of a subscription list in aid.

After another meeting at Osborne House, on the 14th July, same year, his Royal Highness, in order to bring the subject officially to the notice of the Government, addressed a letter to the Home Secretary, which opened a correspondence that eventuated in the appointment of a Royal Commission, dated 3rd January, 1850:—

"In this stage of the proceeding," (we quote again Mr. Cole's Introduction,) "it became necessary to place the accomplishment of the undertaking, as far as possible, beyond a doubt. Having acquired experience, in 1845, of the difficulties to be encountered, the Council of the Society of Arts felt that the proposal must not be brought a second time before the public as an hypothesis, but that the only means of succeeding was to prove that they had both the will and the power to carry out the Exhibition. The Society had no funds of its own available for the advances necessary to be made. The outlay for a building upon the scale then thought of, and for preliminary expenses, was estimated at the least at 70,000*l*.

"After much fruitless negotiation with several builders and contractors, an agreement was made between the Society of Arts and the Messrs.

Munday, by which the latter undertook to deposit 20,000*l.* as a prize fund, to erect a suitable building, to find offices, to advance the money requisite for all preliminary expenses, and to take the whole risk of loss on certain conditions. It was proposed that the receipts arising from the Exhibition should be dealt with as follows:—The 20,000*l.* prize fund, the cost of the building, and five per cent. on all advances, were to be repaid in the first instance: the residue was then to be divided into three equal parts; one part was to be paid at once to the Society of Arts as a fund for future exhibitions; out of the other two parts all other incidental costs, such as those of general management, preliminary expenses, &c., were to be paid; and the residue, if any, was to be the remuneration of the contractors, for their outlay, trouble, and risk. Subsequently, the contractors agreed, that instead of this division they would be content to receive such part of the surplus, if any, as after payment of all expenses, might be awarded by arbitration. This contract was made on 23rd August, 1849, but the deeds were not signed until the 7th November following.

"For the purpose of carrying the contract into execution on behalf of the society, the Council nominated an Executive Committee of four members, who were afterwards appointed the Executive in the Royal Commission, and the contractors their own nominee. In thus making the contract with private parties for the execution of what, in fact, would become a national object, if the proposal should be entertained by the public, every care was taken to anticipate the public wishes, and to provide for the public interests. It was foreseen that if the public identified itself with the Exhibition, they would certainly prefer not to be indebted to private enterprise and capital for carrying it out. A provision was made with the contractors to meet this probability, by which it was agreed, that if the Treasury were willing to take the place of the contractors, and pay the liabilities incurred, the Society of Arts should have the power of determining the contract before the 1st February, 1850. In the event of an exercise of this power, the compensation to be paid to the Messrs. Munday for their outlay and the risk was to be settled by arbitration.

"The Society of Arts having thus secured the performance of the pecuniary part of the undertaking, the next step taken was to ascertain the readiness of the public to promote the Exhibition. It has been shown that the proof of this readiness would materially influence Her Majesty's Government in consenting to the proposal to issue a Royal Commission to superintend the Exhibition. The Prince Albert, as President of the Society of Arts, therefore commissioned several members of the Society, in the autumn of 1849, to proceed to the 'manufacturing districts of the country, in order to collect the opinions of the leading manufacturers, and further evidence with reference to a Great Exhibition of the Industry of all Nations to be held in London in the year 1851, in order that His Royal Highness might bring the results before Her Majesty's Government.' Commissioners were appointed, visits made, and reports of the results submitted to the Prince, from which it appeared that 65 places, comprehending the most important cities and towns of the United Kingdom, had been visited. Public meetings had been held, and local committees of assistance formed in them.

It further appeared that nearly 5000 influential persons had registered themselves as promoters of the proposed Exhibition."

This arrangement, which was gladly availed of by the original projectors of the Great Exhibition, was soon found to be incompatible with the free action of the Commission, the due scope and importance of what was now become a national work. Accordingly, at the first meeting of the Commissioners, held on the 11th January, 1850, the propriety of confirming the contract was discussed, and negatived, with a handsome and well merited acknowledgment, however, "that in agreeing to it at a time when the success of the scheme was necessarily still doubtful, the Messrs. Munday evinced a most liberal spirit, that it has hitherto afforded the means of defraying all the preliminary expenses, and that its conditions are strictly reasonable and even favourable to the public."

The minute adds:—

"The Commissioners feel that in thus abandoning a contract, which, regarded in a pecuniary point of view alone, is undoubtedly advantageous to the public, and resting the success of the proposed experiment upon public sympathy, they have adopted a course in harmony with the general feelings of the community. It now rests with the public to determine, by the amount of their contributions, the character of the proposed Exhibition, and the extent of benefit to industry in all its branches, which will result from it," &c.

The Executive Committee, however, do not appear to have coincided in their views, perhaps with a feeling of doubt, not inexcusable under the circumstances, as to how far public sympathy and the casual contributions resulting from it, would supply the necessary means for so gigantic a project; accordingly they tendered their resignations in the following terms:

"'The members of the Executive Committee submit that the dissolution by the Royal Commission of the contract, which they had been appointed for the purpose of carrying out, has changed the nature of their functions, and even superseded many of them. They are of opinion, therefore, that it is desirable that the Royal Commission should be left as free to select the best organisation for carrying their intentions into effect, as if the Executive Committee had never been appointed. They feel that they should not be acting in accordance with their sincere wishes of witnessing the perfect success of the Exhibition, if they did not come forward to express their entire [illegible] at once to place their [illegible] the hands of his Royal Highness the Prince Albert, and [illegible]

"These resignations were [illegible] accepted, and [illegible] the executive arrangements [illegible] circumstances of the case."

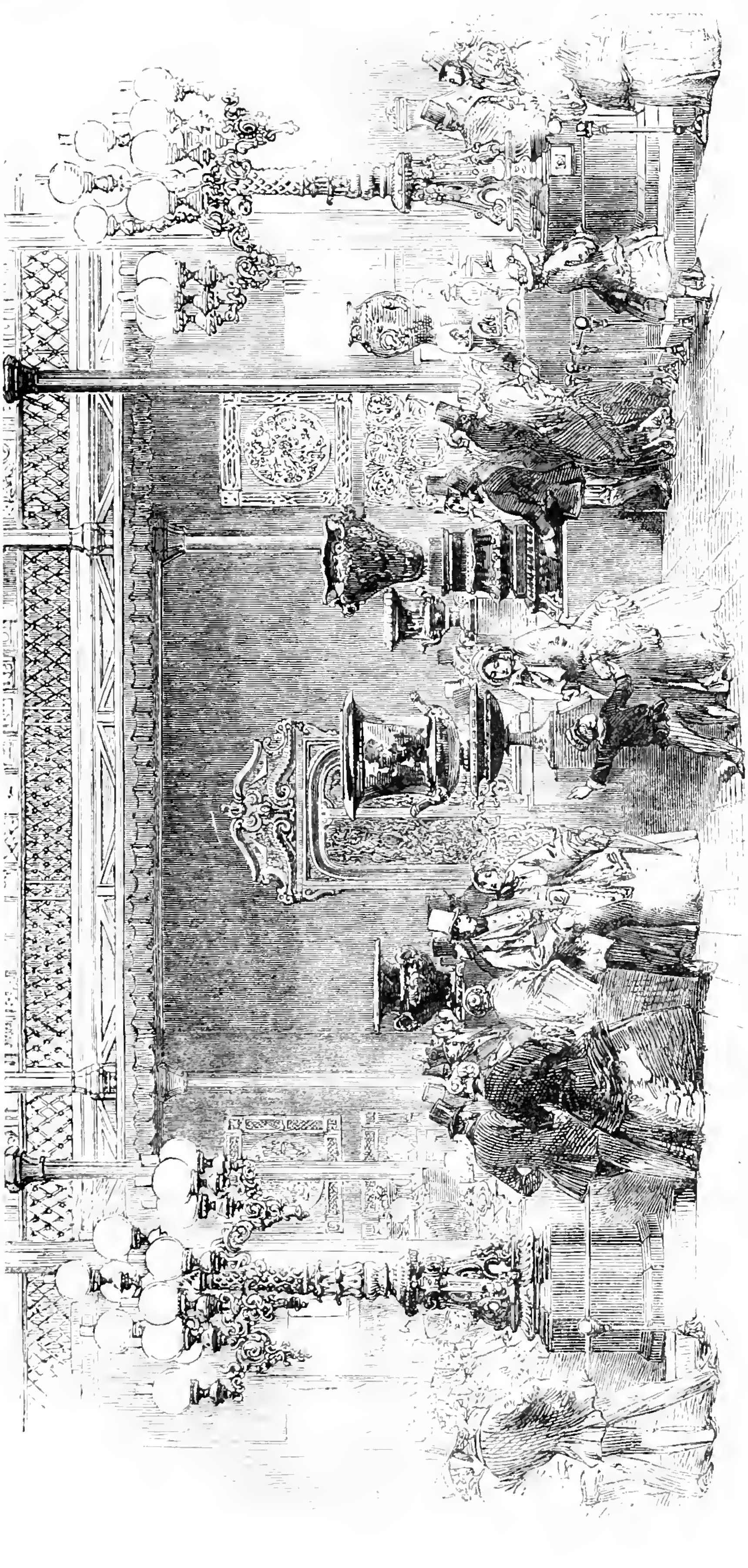
Meantime Prince Albert, and the [illegible] promoters [illegible] unceasing in their exertions, [illegible] what related to the [illegible] arrangements for the Exhibition [illegible], but in awaking the [illegible] to the useful and interesting results which [illegible] expected [illegible]

"His Royal Highness, in his speech at the York banquet, said, in the name of the Royal Commission: 'Although we perceive in some countries an apprehension that the advantages to be derived from the Exhibition will be mainly reaped by England, and a consequent distrust in the effects of our scheme upon their own interests, we must, at the same time freely and gratefully acknowledge, that our invitation has been received by all nations with whom communication was possible, in that spirit of liberality and friendship in which it was tendered, and that they are making great exertions, and incurring great expenses, in order to meet our plans.' Upon the same occasion, Lord Carlisle, one of the most enlightened men of the age, thought that 'the promoters of this exhibition were giving a new impulse to civilisation, and bestowing an additional reward upon industry, and supplying a fresh guarantee to the amity of nations. Yes, the nations were stirring at their call—but not as the trumpet sounds to battle; they were summoning them to the peaceful field of a nobler competition; not to build the superiority or predominance of one country on the depression and prostration of another—but where all might strive who could do most to embellish, improve, and elevate their common humanity.'

"And Lord John Russell said, 'I participate with my noble friends who have spoken, in entertaining hopes of the brightest kind from the Exhibition of next year. I do so, because I think, as I have said elsewhere, that there are not only direct, but many collateral benefits likely to accrue from this project; and now, let it be remembered, we are about to try what can be effected by the arts of peace. Thirty-five years ago, the nations of Europe were emerging from a dreadful, costly, and sanguinary war; in the course of this war, the various nations of Europe exhibited, let it be confessed, all the virtues of war—hardihood, enterprise, and fortitude, enduring, for the sake of national independence, the greatest and most painful sacrifices; they suffered all this because, whether war was wisely or unwisely entered into, national independence was felt to be the prize, for the preservation of which every effort should be made. But if the nations of Europe then exhibited, with scarcely an exception, those virtues which belonged to war, I think, after so many years of peace, it is now for us to show that there are advantages which can be gained from peace—that there are virtues which belong to peace; and, I trust, in the Exhibition of next year, we shall show that we can promote the comforts—that we can enlarge the knowledge—that we can strengthen the kindly affections of mankind towards each other, and produce effects which, great as were the virtues in war, will be far more profitable to the world generally, and more consonant with the lessons which we learn from religion and morals. I trust, therefore, we shall show, not only that peace has been victorious as well as war, but that those victories have a far clearer, purer glory than any that can be obtained by combat and the destruction of men by each other; and if we can accomplish this, not only this country, but the nations of the world, will have reason to be grateful to that Prince who has framed this project, who has persevered in it against all opposition, and who is about to reap the reward of exertions attended with no individual benefit, but with much labour to himself, but which have been dictated by a lively concern for the interest and earnest aspiration for the true welfare of mankind at large."

"At a meeting in Birmingham, Mr. Cobden, in speaking of the advantages that might be expected to flow from this exhibition, said, 'We shall by that means break down the barriers that have separated the people of different nations, and witness one universal republic; the year 1851 will be a memorable one, indeed: it will witness a triumph of industry, instead of a triumph of arms. We shall not witness the reception of the allied sovereigns after some fearful conflict, men bowing their heads in submission; but, instead, thousands and tens of thousands will cross the Channel, to whom we will give the right hand of fellowship, with the fullest conviction that war, rather than a national aggrandisement, has been the curse and the evil which has retarded the progress of liberty and of virtue; and we shall show to them that the people of England—not a section of them, but hundreds of thousands—are ready to sign a treaty of amity with all the nations on the face of the earth.'"

We pass over the intervening struggles,—the discouraging effects of the apathy, not disguised and not to be doubted, on the part of a large portion of the industrial class,—not only agricultural but manufacturing; the tardy and niggardly filling up of the subscription list, which amounted in April, 1851, to only 75,000*l.*, of which, about 65,000*l.* had been paid in; the doubt as to the necessary funds being procured to pay for the purchase or hire of a suitable building for an entertainment to which the whole would have been invited. Suffice it to say, that on the 15th July, 1850, a charter of incorporation was granted to the Commissioners (which relieved the individual members of it from the responsibilities under which they had previously lain); and in August, a guarantee fund of 230,000*l.* was subscribed by a limited number of individuals, some of whom were commissioners, upon security of which, the Bank of England consented to make such advances as might be required from time to time.



RUSSIAN DEPARTMENT—MALACHITE DOORS, &c.

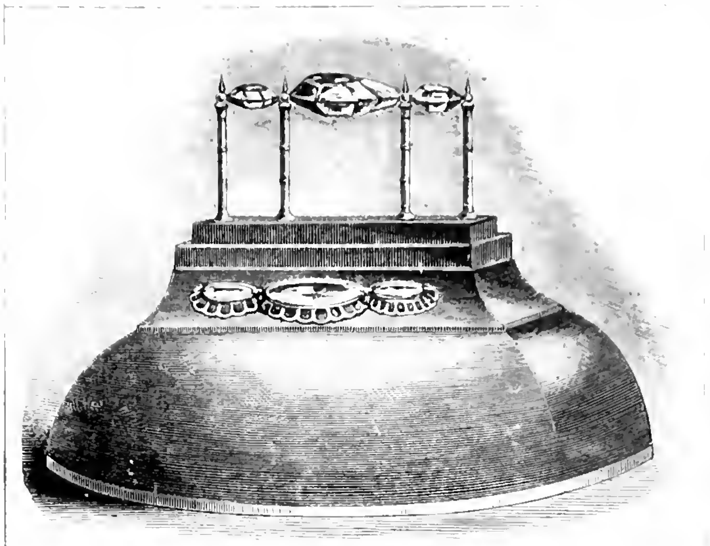
THE RUSSIAN DEPARTMENT.

THAT portion of the Russian exhibition shown in our Engraving comprises several articles of great value, from their rarity and workmanship, and of real beauty of material and design. It is a department, however, made up entirely of articles for those whose wealth enables them to set no limit to the indulgence of their tastes. By the pillars stand two great candelabra, of richly-gilt bronze, each ten feet in height, and made for fifteen lights. They are from the manufactory of Krumbigel, of Moscow, and were entered for duty at the value of 500*l.* a piece. Looking from the centre aisle into the compartment, the most striking object is the folding doors of malachite, thirteen feet high, panelled and ornamented in gilt bronze. Our readers have probably made acquaintance with malachite as a precious stone, in brooches, jewel-boxes, and other small articles of ornament, but never dreamt of seeing it worked up into a pair of drawing-room doors. The effect is exceedingly beautiful; the brilliant green of the malachite, with its curled waviness like the pattern of watered silk, and its perfectly polished surface, is heightened by the dead and burnished gold of the panellings and ornaments, and sets one imagining in what sort of fairy palace and with what other furnishing and decoration the room must be fitted to satisfy those who had made their entrance by such precious doors. They are valued at 6000*l.* The large vases on either side of the compartment are also, pedestals and all, in malachite like the doors, ornamented in gilt bronze, and are valued at from 1500*l.* to 3000*l.* a piece; and to show that a whole suite of apartments might be decked out in the same bright precious stone, there stands to the left and not far from the doors, a mantelpiece, in Louis Quatorze style before it ran quite wild in confusion of ornamental form: the fender, hearth, fire back, and grate are in bronze gilt and burnished gold: the mantelpiece in beautifully shaded malachite, with just enough of ornament for contrast; and on either side of this splendid fire-place are a table and chair of the same material. The chairs are valued at 120*l.* each, the tables at 400*l.* In the next compartment the malachite (carbonate of copper), is exhibited in the strange-shaped rough lumps in which it comes from the mine, and in every stage of preparation. It is found in the copper-mines of Siberia and the Ural Mountains, and has lately been met with in equally large pieces, and of not less beauty, in the Burra Burra mines, in Australia. That in the Exhibition is from the mines of Prince Demidoff. The manufacture of articles of malachite is in itself a work of art; and, smooth as the surface seems, it is made up of a multitude of variously-shaped little pieces carefully selected to produce particular patterns, and which in their fitting require the greatest exactitude. In the doors there may be some 20,000 or 30,000 pieces imbedded in cement, made of the malachite itself. The doors are of wood covered with copper, the malachite being about a quarter of an inch thick. The vases are of three-quarter inch cast iron, and the malachite in the same way inlaid. Nor is this the only precious stone made to serve such large uses in this Russian compartment; there are also upon the left-hand side, near the great candelabrum, three real jasper vases, one of them three feet six inches in height, which has excited the admiration of those most skilled in such matters by the exquisite cutting of its border of leaves, which, as the process is not explained, they have come to the conclusion must have been done by mounting the diamond, the only mineral of sufficient hardness to cut agate, in some specially contrived machine: the value of this vase is not stated, but the cost of the workmanship alone exceeded 700*l.*, and the vase can certainly not be under 2000*l.* These vases are the property of the Emperor, and were made at his own manufactory at Katrinburg. The great vase in the centre front is in porcelain, from the imperial manufactory at St. Petersburg, and is valued at 2500*l.*

To the left and right in front are jewels valued at 40,000*l.*, and which are exhibited by M. Bolin and M. Kammerer, both crown jewellers at St. Petersburgh. Nothing can exceed their richness and splendour.

The plate which is on another table at the right, and comprises a great variety of articles, is entirely from the workshop of M. Sizikoff, of Moscow, one candelabrum shown by whom contains 2 cwt. of silver, and sets forth an incident memorable in Russian history. The Duke de Merti, Grand Duke of Muscovy, in a fierce battle with the Tartars, in 1380, fell severely wounded by a blow on the head with a hammer, a main weapon of warfare with the Tartars then: the Duke, surrounded by his staff of knights in armour, lay under a fir tree, faint and, to all appearance, dying, when a soldier of his army galloped up and announced the battle won—the Duke revived and recovered. The candelabrum represents the fir tree and the above incident.

On the same side of the compartment is an ebony cabinet, designed by Baron Clott, one of the first artists in the Russian empire. On the top is a bunch of grapes, in amethyst, so modelled, that as the light falls upon them, they seem to show the very juice of the real fruit, and which are set off by a sprig of mountain ash in coral.



THE KOH-I-NOOR.—SEE NEXT PAGE.

In the background are seen specimens of inlaying in wood for floors; a Warwick Vase, in hammered iron, from Warsaw; a curious carpet, very bright in its colour and effect, made in squares of squirrel skin, surrounded each by a border of needlework; and near this stands a cabinet, made by M. Yan[illegible], of St. Petersburgh, in light wood, with porcelain medallions from the Imperial manufactory, valued at 500*l.*, and a second porcelain vase of azure and gold, from the same works.

Almost all the articles exhibited in this Northern Bay are the produce of a system, almost universal among the monarchies of Europe, of carrying on Royal or National manufactories, as a matter of luxury and as an example of taste. Such in France are the national manufactories of Gobelins tapestry, of Beauvais carpets, and Sevres china; in Prussia, of iron casting and porcelain; in Saxony, of porcelain; and in Tuscany, of mosaic in *pietra dura*. To several of these establishments, particularly in Russia, and in the Gobelins establishment in France, schools for instruction in drawing and painting as applied to manufactures are attached for the benefit and the due training of workmen. In England, it is with difficulty that money is obtained for schools of design; but although we wisely rely on private enterprise for manufacturing excellence, it would pay us to devote more money to cultivate taste.

On leaving the splendid department dedicated to luxury and fine arts, we find in the small avenue to the north some more real and utilitarian specimens of Russian industry, in a set of very handsome carriages, of a

ARIADNE, BY KIRK.

SCULPTURE.

The works of Sculpture, both British and foreign, which conduced so highly to the decorative character of the Great Exhibition, will come in for a full share of our notice. They are important, not only for their individual merits, but for their influence in the culture of a pure taste for the beautiful and truthful in Art; and it cannot be too strongly urged, that, the same principles which regulate invention and taste in that which is called High Art, apply in degree to every branch of ornamental manufacture. This is a point, however, upon which we shall enter at more length on a future occasion.

The subjects chosen for our present page are Kirk's "Ariadne," a very pleasing specimen of the romantic style, and the "Rosamunda" of John Thomas, without doubt one of his best works, the attitude being dignified and graceful; the costume is somewhat mediæval in character, the same feeling pervading the monumental details.

ROSAMUNDA BY J. THOMAS.

peculiar national form. These are the Russian drosky, equally available on wheels, or in the winter on runners, and the favourite carriage of Russian gentlemen. They are on four wheels, very low, with a strong iron forked perch, and a double body, the first of which either holds one or two persons abreast. There are specimens of both kinds: the other merely holds a seat for the driver, who sits close upon his horse or horses; when a pair are used, the correct thing is for a shaft-horse to trot, while the second, harnessed to an outrigger, gambols at a canter beside him. They are very stylish, and the workmanship deserves unqualified praise, except the shafts, which are heavy and clumsy. The leather splash-boards round the wheels are particularly well arranged—no stitching appears, and they look like pieces of solid japan: the lining and the varnishing are equally well finished. If the wood is sound and well seasoned, they are not dear at the price set upon them—47*l*. A set of harness in the large room is also of a fashion peculiar to Russia. It is difficult to explain, to those who have never seen them in use, the arrangement of a great birchwood bow, which is an indispensable ornament of Russian harness, and from which bells are suspended over the horse's neck.

The staples which constitute the export trade of Russia, are exhibited in great variety: one part of the walls is hung with leather, including choice specimens of the "Russia" dear to book collectors. Amongst the boots and shoes are a pair of dress-boots, made of the thinnest and best calf leather we ever remember to have seen. It is as soft and flexible as kid, but stronger. We are informed that the material is much used in Russia for full dress boots. If it can be delivered here at a reasonable price, a large demand is certain.

On the same counter as the leather are a number of stockings, shoes, and other articles made of felt by the Russian peasantry. A very curious manufacture indeed, well worth the examination of the trade. Each article seems felted separately, and made solid yet soft. On the opposite table are basins, jugs, cups, helmets of the same material japanned inside and out. They are light, tough, and not to be broken. A washhand jug and basin are rather dear (17*s*.), but they would be famous articles for sea voyages. Gutta percha has been tried for that purpose, but it melts in tropical climates.

A trophy of sheafs of seed-bearing agricultural produce, very elegantly arranged, containing every kind of wheat, barley, oats, rye, buckwheat, flax, hemp, peas, and beans, grown in the Russian dominions, occupy the centre of a counter, round which are arranged in bowls the seed and flour of these articles. Among them our cooks may find it worth while to try a small kind of dried pea for winter use, in soups, of a very sweet taste. On the walls around are specimens of the famous Russian hemps, raw and manufactured, with canvas and ropes and twine, which, with grain and tallow, are too well known to our merchants for this last hundred years to need further notice.

The dried provisions include *caviare*, dried sturgeon, isinglass, a substance resembling isinglass made up in the shape of a rude whip which is obtained from a fish called the *Vesiga*, and used in Russia to make pies; but, perhaps, the article most likely to become a new staple of commerce is the *glaze*, now imported, as we are informed, for the first time. This article, so much used in this country for making sauces and soups in clubs, hotels, and great houses, is obtained in Russia by boiling down the flesh of horned cattle, which, on the plains of the interior, are only valuable for their hides and tallow. Anything that can be made out of concentrated meat or glaze is so much additional profit. But it is an operation which requires care—a little burning will spoil the whole boiling. Liebig gives directions for the operation in his last work: as commonly conducted, the product affords very little nourishment.

The specimens of iron and copper, in ore and in a manufactured state, are numerous. The iron, some of which is of a very fine quality, , is a matter of interest to us; because Russia, in conjunction with Spain and Sweden, supplied most of the iron consumed in this country for more than 100 years, between the time that the timber for charcoal in Surrey, Sussex, Kent, Staffordshire, and Worcestershire, was exhausted, and the successful application of coal to smelting iron, by Abraham Darby, at the Colebrok Dale works, in 1713, and the application of the use of blowing cylinders, instead of bellows, at the Carron Works, set up by Smeaton in 1760.

Our connexion with the Russian iron is of very ancient date. In 1569 the English obtained by treaty the right of seeking for and smelting iron ore, on condition that they should teach the Russians the art of smelting this metal, and pay, on the exportation of every pound, one halfpenny.

Every branch of mining received great development under Peter the Great, who seems to have neglected no branch of material prosperity. It was under his reign and direct patronage that the Demidoff family rose to importance as miners, and obtained the property which has rendered them ever since one of the wealthiest families in Europe. Up to 1784, Great Britain imported a continually increasing quantity of iron from Russia, which in that year amounted to forty thousand tons: after that period, in consequence of improvements in machinery for smelting by coal, the importation gradually declined to about five thousand tons in 1805, and continued at that figure up to 1837, and, probably, is about the same now, being all of one quality in the trade, called C. C. N. D. old sable iron, which is used for the manufacture of steel.

The fire-arms and white arms exhibited have all been made at one of the four Crown manufactories, where the work is done, under the inspection of Government officers, by serfs of the Crown. The oldest manufactory is at Tula, where, besides muskets, and side-arms, the iron work of horse harness, iron bedsteads, files, chains, &c., are made. This establishment was burnt in 1834, according to the rumour of the day, by the workmen, who hoped to get rid of the forced labour imposed on them by the ceaseless wars of the Emperor in Turkey, Persia, and the Caucasus. Under the Russian Royal Factory System, increased work does not give increased wages. But the Tula establishment was rebuilt.

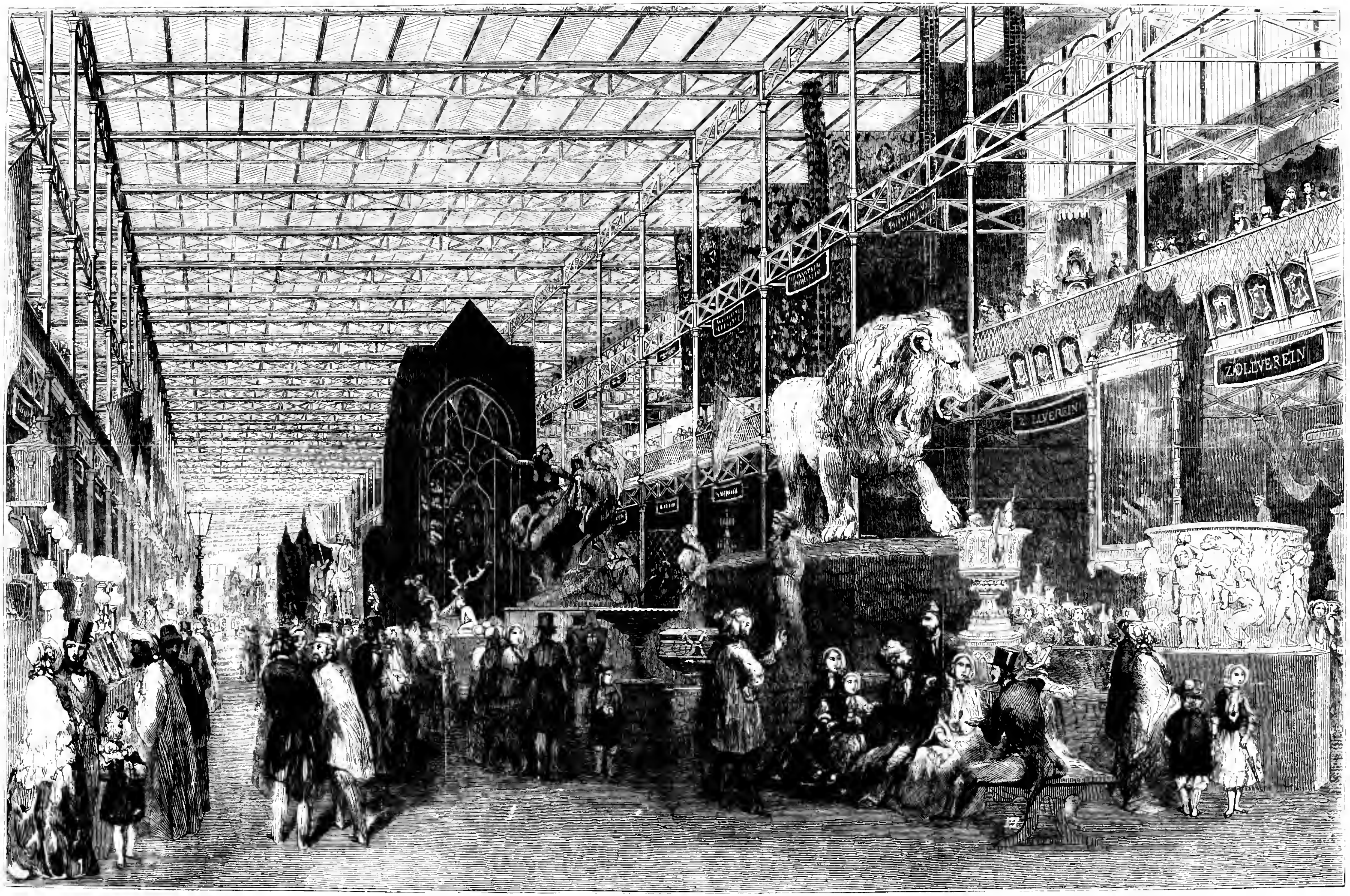
In the North Gallery, the Emperor exhibits, with other furs, a black cloak made from the neck of the silver fox, which he has valued at 3500*l*.; this valuation brought out a letter from Mr. Nicholay, the well-known furrier, who offers to make a finer cloak for 1000*l*., and explains that black and silver fox skins, so much valued in Russia, and so little used here, are chiefly imported into London from the territories of the Hudson's Bay Company, and then purchased up for the express purpose of "being smuggled into Russia as occasion may offer." What a commentary on the Russian protective system!

In the back of the same case as the furs, are two splendid specimens of twilled shawls, by a Cossack woman, from white goats' hair, of wonderful fineness. One of these shawls is the property of the Empress, and justly valued at the price of Brussels lace.

Russian manufactures are for the most part inferior and dear, while mineral, and vegetable, and animal produce could be supplied in unlimited quantities, at a profit, if roads were made and facilities given to trade. But Russia is essentially a military country, prepared to take advantage of events, and probably the Emperor considers that a large trade might produce inconveniently pacific tendencies in his land-owning nobles.

THE KOH-I-NOOR—ANCIENT AND MODERN HISTORY.

The following interesting particulars relative to the great diamond of the Exhibition will probably be not unacceptable to our readers. The Koh-i-noor is one of the most valuable diamonds known, there being only two others estimated at a higher price. One of these is the great Russian sceptre diamond, a perfectly round and beautifully cut brilliant, the finest diamond in the world, and valued at 4,800,000*l*.; the other belongs to the little kingdom of Portugal, but is uncut: it is the size of a turkey's egg, and is supposed to be still more valuable, but it has never yet been entrusted to a lapidary. The Koh-i-noor has long enjoyed both Indian and European celebrity, and has accordingly been the subject of much traditionary fable as well as historic record. Hindoo legends trace its existence back some four or five thousand years, and it is mentioned in a heroic poem of great antiquity, still preserved, called *Mahabarata*, which would imply that it is one of the most ancient of all the valuable precious stones that have come down to our times. The poem in question details its discovery in the mines of the South of India, and states that it was worn by Karna, King of Anga, one of the warriors slain during what is called the Great Indian War. The date of this war is fixed by other and trustworthy testimony in the year 3001 before Christ, or nearly 5,000 years ago. No mention is made of the diamond in Indian record or fable from this period up to the year 56 before Christ, when it is referred to as being the property of Vikramaditya, the Rajah of Nijayin, from whom it descended to his successors, the Rajahs of Malwa, until the principality was subverted by the Mohammedan conquerors, into whose hands it fell, with other spoils, said to be of greater value than were ever before or since amassed in India. Whatever may be thought of the legend that gives so high an antiquity to the Koh-i-noor, it might be expected that some more trustworthy information would be available when we come down so low as the beginning of the fourteenth century. The Mohammedans, in their turn, became, about this period, subjugated; the principality of Malwa was invaded and overrun by the armies of Ala-adin, the Sultan of Delhi, in 1306; and, according to the autobiography of Sultan Baber, whose book is of undoubted authenticity, it became the property, with other treasures, of the Sultan Ala-adin. That it did become the property of the sultans of Delhi, and remained for a long period in the possession of that dynasty, there can be no doubt, although some ancient Indian historians ascribe its possession to fraud or treachery, and others to still less worthy motives. When we reach a period of about 200 years back we get upon satisfactory ground, and here may be said really to commence the modern history of this singular diamond. Jean Baptiste Tavernier, an enterprising and intelligent French traveller, and an eminent jeweller, although dignified by the French monarch with the title of Baron l'Aubonne, visited India about the year 1660, for the purpose of purchasing diamonds and other jewels. His profession and his personal character would appear to have recommended him to the favourable attention of the nobles of the Court of Delhi, and even of Aurungzebe himself, by whose command Tavernier was permitted to inspect, and handle, and weigh the jewels in the imperial cabinet. Among them was one which far surpassed all the rest in size and value. Tavernier describes it as rose cut, the shape of an egg cut in two lengthwise, of good water and great transparency, and weighing 319 ratis, which he says is equal to 280 of our carats. There is but little doubt that the diamond thus examined and described by Tavernier, as forming one of the collection in the Delhi cabinet 200 years ago, was the Koh-i-noor. Baber, the Mogul Emperor, to whose autobiography we have already referred, obtained a diamond corresponding exactly with this in the course of his conquests, and it passed eventually into the possession of the ruling family of Kabul. Nadir Shah, on his occupation of Delhi in 1739, compelled Mohammed Shah, the great-grandson of Aurungzebe, to give up to him everything of value that the imperial treasury possessed; and his



FOREIGN NAVE, LOOKING WEST.—ZOLLVEREIN AND BELGIAN DEPARTMENTS.

THE MANUFACTURE OF NEEDLES.

The art of needle-making, in many of its departments, presents much that is generally, or, to use a term common-place enough, popularly interesting to a large class of readers; yet, remarkably little is known as to the manner in which the tiny article in question is produced, and of the immense number of the "needle using population," but a small proportion have a due conception of the operations and processes through which a needle goes, from its rough form to the beautifully polished instrument used oft "by ladye fair, and maide of low degree."

Needles, as all our readers are aware, are made of steel, the steel being made into thin wire, of a diameter proportionate to the fineness of the needles to be made. As the wire is brought to the factory in circular bundles, the first operation is untying them and cutting the wire into certain determinate lengths. A pair of shears, of large dimensions, are fixed to the wall of the cutting shop, having the blades uppermost; one limb is fastened, the other is loose. The workman is provided with a gauge by which the length of the wire to be cut off is determined. Uncoiling the bundle of wire, he puts the end into the gauge, and placing the series of wires forming the thickness of the coil between the blades of the shears, he presses against the loose limb with his thigh, and, by moving the coil up and down to assist the cutting action, he speedily severs the lengths from the coil. Proceeding thus, he cuts off a series of lengths till the coil is exhausted: out of one coil he may thus obtain as many as 40,000 distinct wires. The coil being circular, it is evident that each individual wire must partake somewhat of its curvilinear shape; in fact, each is far from being straight. As one of the requisites of a needle is that it shall be straight, the next process is to straighten all the wires. Supposing two of the curved wires to be placed in the palm of one hand, and rubbed quickly, backwards and forwards, by the fingers of the other, a slight straightening would ensue; but, if the needles were removed to a hard, flat surface, as a table, the operation would be much facilitated. If, however, a dozen or two of wires were to be placed on the table, and so kept as to lie close to one another, and then rubbed, the pieces, rolling one upon another, would soon be straightened, as the round part of one would roll upon the flat part of another, and thus, by the continuance of the process, the whole wires would be straightened. This is, in fact, the *rationale* of the process carried on at this stage of the manufacture. Two rings of iron are provided, some 3 inches in diameter, ½ inch broad, and the same thick; these are placed a distance apart on a flat stone slab some 18 or 20 inches from the ground. The distance between the rings is such, that, when the wires are placed within them, the ends are flush or even with the outer surfaces. Supposing a number of wires are placed thus, sufficient to fill the interior of the rings one-half of their diameter or so; the whole are fastened tightly in, and placed in a furnace and heated to a red heat. They are then taken out, placed on the slab, and the fastening removed, so that all the wires are free to move one upon another. The workman then takes a piece of curved iron, some inch-and-a-half broad and half-inch thick; he places the curved or convex side of this on the top row of wires between the rings, and pressing forcibly by means of his hands at either end of the iron, work the rings briskly backwards and forwards on the slab. By this means the wires are kept rolling upon each other, and continually shifting their places, thus presenting a new portion of their surfaces to the action of their neighbours. The shifting of the wires may easily be ascertained by inserting a piece of cold wire, which, being black, is easily observable among its red neighbours, near the bottom of the ring. In a few seconds it will be seen at the top, its course being distinctly traced, winding its eccentric way amongst the others. When cold, the wires are all straight. The next operation is the pointing. In order to save time, each wire is long enough to form two needles; each is therefore pointed at both ends. The grindstones by which the wires are pointed are of small diameter, not more than 10 or 12 inches, but they revolve at an immense velocity, the moving power being generally water-wheels. Each grinder sits on a low stool, in front of the grindstone, a small trough of water being placed before him. Taking up 60 or 100 needles, according to their quality he places them on the palm of the right hand, so that the ends project over the length of the forefinger. Next placing the left-hand fingers on those, the thumb grasping the back of the right, he is enabled so to move the whole range of wires that they may rotate with ease on their axis, and yet without rolling over one another. He then applies the points of the wires to the rapidly revolving grindstone: if he hold them always in one direction, the action of the stone would be such, that the points would be bevilled off like chisels; but by the fingers he makes them all to revolve, thus giving to each a gently tapering and perfectly round point. As the wires are apt to project unequally over the finger, thus presenting one wire longer than another to the grindstone, the workman every now and then strikes the points gently against an upright flat-faced piece of timber, somewhat in the same manner as a person shuffling a pack of cards makes them all even by knocking their ends upon the table. On the wires becoming red-hot, the workman dips them into the trough of water placed before him. A brilliant stream of fiery sparks is continually passing from the points. The matter thus evolved being inhaled into the lungs of the workmen, formerly rendered them a peculiarly short lived race. The deleterious products are now, however, by the use of a powerful fan, drawn away from the zone of respiration as soon as they are produced. The trade is now as healthy as any other. The operation of grinding is exceedingly interesting, and presents an exemplification of the dexterity attainable by long practice in any one branch; but this remark is equally applicable to many other departments in the manufacture of needles. A good workman can point upwards of 10,000 in an hour. It is amusing to see the rapidity with which he will take up a handful of wires, point an end of them all, and turning them so as to present the other ends to the stone, lay them aside perfectly pointed at both ends.

The wires thus pointed are next taken to the "stamping shop," and here the wire first gains its approach to a needle. Such needle is to be rounded at the head, and have a hole made there, called the eye, as also an indented channel on each side, called the "gutter" of the head: the stamping makes the round form, and marks the place of the eye-hole. A wooden-framed stand, or table, is provided with a massive anvil, on the upper surface of which is placed a die or design intaglio; a weight is suspended by a rope over a pulley placed above the table, and plays between two vertical guides; the same design as in the die is made on the lower surface of the weight, but in relief, or protruding from the surface. The lower end of the rope sustaining this weight is provided with a stirrup, in which the workman can place his foot. Standing before the table, he takes a number of needles in his left hand, and with his right, places each wire exactly in its centre on the lower anvil or die, and letting the weight drop suddenly, by raising his foot, the design is impressed on the centre of the wire, on both sides. The round circles are the places through which the eye-holes are to be punched; they are very slightly indented at this stage, merely enough to denote their situation. By depressing his foot, the workman lifts the weight, and places another wire on the die, allowing the weight to drop suddenly, as before: the impression is made, and the wire cast aside, to be replaced by another, and so on. So rapidly is the process gone through, that it is actually inducive of an optical deception. The workman takes each wire from his left hand, places it upon the die, withdraws it, and throws it aside to take up another so very quickly, that a quick-eyed witness of the operation actually believes that it is but one and the same needle that the operator is moving out and in. Considerable nicety is required in the stamping, as each wire is to be placed so that it will be struck exactly on the centre; the chief guide to aid him is the eye; and so rapidly does he become aware of its being wrong placed, that he arrests the fall of the weight at any particular point of its descent: indeed, the facility with which he can do this by the immediate action of the foot is not the least remarkable matter observable in this department.

The eye-holes are next to be punched. This operation is generally performed by little boys. A small screw-punch is used for this purpose. The lower end of the punch is provided with two projecting points placed at a distance from each other, exactly equal to that between the indentation formed in the wire, through which the eyeholes are to be made. The little operator, taking a number of the stamped wires, spreads them out like a fan, and placing each one on the centre of a small slab, brings down the upper slab, which makes the holes in the wire forming the eyes. This is a very nice operation, as the slightest misplacement of the wires, so that the centres were not in the right places, would involve the spoiling of each, from the punches passing through wrong places. To guide the operative, a small indentation is placed in the lower slab, or bed; into this the wire is placed: by means of this, a delicacy of touch, and a quickness of the eyesight, almost every wire is placed on the slab, and properly punched in the exact places.

Each of the wires has two moulded parts, gutters, and eye-holes in the centre; the next operation is the dividing of these so as to form two needles. The first step in dividing the wires is what is termed "spitting," that is, passing a fine steel wire through the eyes of perhaps a hundred wires, as there are two eyes there are also two wires; when they are all thus spitted, by bending them backwards and forwards between the hands, they are broken in the centre, one half remaining on each wire. Before dividing them, however, the protuberances on either side, are filed off, by placing the wires (spitted) on a convex block, keeping them tight thereon by means of a leather band, while the workman uses a smooth file. When broken, each needle has a square head. It is nicely moulded by means of a very small grindstone.

We have thus far traced our piece of wire to a very respectable-looking needle; but it is by no means fit for use: to make it so, it has to undergo many other processes. The needle, at the stage we have arrived at, is so soft that it can be bent between the fingers as easily as a piece of lead of the same diameter. They therefore require to be hardened. Previous to the hardening, the "soft-straightening" is to be gone through. This operation is meant to restore the straightness of each needle, lost by the repeated processes which it has gone through, as "pointing," "stamping," &c. The "soft straightening" is simple. The operative sits at a bench having a flat surface. Placing the needles parallel to one another on this, he presses a convex piece of iron on each of the needles, rolling it over and over, until it is straightened. So quickly is the operation effected, that a good workman may straighten upwards of 3,000 needles in an hour. The straightened needles are then hardened by being heated to redness in an oven or furnace, and suddenly plunged into cold water or oil. This makes them so brittle that they can be broken as easily as glass. They require, therefore, to be "tempered." This is effected by placing them on a hot plate, and moving them about so as to present each needle in succession to the action of the plate. As soon as they have all acquired a particular colour, they are removed. When cold, they are then beautifully elastic. As they are, however, slightly distorted by the action of the

biographer, a secretary, specifies a *peshkash* or present by Mohammed Shah to his conqueror of several magnificent diamonds. According to the family and popular tradition, Mohammed Shah was in the habit of wearing the great diamond in the front of his turban, and on the first interview between himself and his wily conqueror, the latter insisted upon exchanging turbans as a proof of his regard and friendship. In whatever way he obtained it there is little doubt that the great diamond of Aurungzebe, which was then famous all over the east, was in the possession of Mohammed Shah at the time of the Persian invasion, and that it then changed masters and became, according to the concurrent testimony of all the Indian writers and historians, the property of Nadir Shah, and it was when it came into his hands that it first obtained the name of the Koh-i-noor. Upon the death of Nadir the diamond, which he had wrested from the unfortunate representative of the house of Timur, became the property of Ahmed Shah, the founder of the Abdali dynasty in the kingdom of Kabul. It is generally believed that Ahmed Shah prevailed upon the young son of Nadir Shah to show him the diamond, and then retained possession of it, Shabrick, the young man, not having the means of enforcing its recovery. We have thus traced the Koh-i-noor to Kabul, and its subsequent fortunes are no longer matter of doubt or question. The jewel descended to the successors of Ahmed Shah, and when Mr. Elphinstone was at Peshawur he saw it worn by Shah Shooja as an armlet, surrounded with emeralds. When Shah Shooja was driven from Kabul, he became the nominal guest and actual prisoner of Runjeet Sing, who spared neither importunity nor menace to get possession of it, and ultimately in 1813 he induced or compelled the fugitive monarch to resign the precious gem, presenting him on the occasion with a lac and 25,000 rupees, or about twelve thousand pounds sterling. Shah Shooja's own account, however, differs materially from this. He states that Runjeet Sing assigned to him in exchange for it the revenues of three large villages, not one rupee of which he ever realised. Runjeet was highly elated by the acquisition of this valuable gem, and wore it as an armlet on all state occasions. When he was dying an attempt was made by the persons about him to persuade him to make the diamond a present to the great Indian idol, Juggernauth, and, according to the statement of the parties interested, the priests, he intimated his assent by an inclination of his head. The treasurer, however, in whose charge it was, refused to deliver it up without some better warrant, and Runjeet, dying before a written order could be made out and signed by him, the Koh-i-noor was preserved for a while to his successors. It is frequently mentioned in the narrative of state ceremonials and public festivals after this period, and appears to have been occasionally worn by Rhurreuk Sing and Shu Sing. After the murder of the latter monarch, it remained in the Lahore treasury until the supersession of Dhuleep Sing and the annexation of the Punjab by the British Government, when the civil authorities took possession of the Lahore treasury, under the stipulations previously made, that all the property of the state should be confiscated to the East India Company, in part payment of the debt due by the Lahore Government and of the expenses of the war. It was at the same time stipulated that the Koh-i-noor, as being a state jewel, and not readily convertible into rupees, should be presented to the Queen of England. Such is the strange history of certainly one of the most extraordinary diamonds in the world. After the Company became possessed of the gem, it was taken possession of by Lord Dalhousie, and sent by him to England in charge of two officers. We have no record of the precise time when the jewel was cut and polished. One account states that the Italian lapidary by whom it was cut, having performed his task in an unworkmanlike manner, was immediately executed. A close examination of the facets shows that they are very inartistically formed and bear by no means the high polish which a diamond of its great purity ought to exhibit. This, with its peculiar shape will account for the small amount of refractibility it displays, and is evidence of its having been cut and polished before the lapidary's art had arrived at its present degree of perfection. Its weight has been considerably reduced by the cutting, and the opinion of the most eminent jewellers and lapidaries in this country is, that it will require some further reduction before it can be considered a perfect gem. The flood of red light which the sun now pours in upon it through the crimson cloth covering and the rich colour of which is reflected by the numerous jets of gas, is evidently a most injudicious arrangement, and ill calculated to display the brilliancy of the diamond, which will require to undergo another change of scenery and decorations before it reveals its full splendour and beauty.

The old phrase of "spoiling the Egyptians" was amusingly reversed on Thursday-week, in the case of a family of Egyptian Arabs, consisting of a tall old Sheik, in oriental tatters; two or three women, jealously concealed in voluminous linen, by no means of the whitest, and four little boys, who might have boasted that their faces had never been washed since their birth. On arriving at the barriers, all the interpreters in the establishment were put into requisition to explain to the Sheik the inevitableness of the preliminary shilling, but all in vain. He had neither money nor comprehension, and the gordian knot was at length cut by permitting him and his distinguished family to go in on credit. Thus, instead of a Jew or Gentile "spoiling the Egyptians," the Egyptian succeeded in spoiling the royal commissioners; and the case deserves to be recorded as the first successful attempt at the Crystal Palace.

PRINCE ALBERT'S CACHMERES.

This contribution of his Royal Highness Prince Albert has been an object of great interest to all interested in the woollen and worsted manufactures of this country, and not the less so because it indicates the eminently practical turn of the mind of the Royal contributor whose interest in the progress of industry never flags. The specimens of manufacture are arranged in a tasteful glass case, appropriately placed in the Central Avenue, in front of the department to which they belong, as a trophy of that class of articles. They consist of two shawls, two dress pieces, and a specimen of coarse woollen cloth manufactured from the wool of the Cachmere goats kept by his Royal Highness Prince Albert in Windsor Park; and the experiment has been made at his suggestion, and for him, by Messrs. T. Gregory Brothers, of Shelf, near Halifax, and Messrs. John Haley and Son, of Bromley near Leeds.

In the raw state, the Cachmere goat's wool is very peculiar in its character, consisting, as it does, of two distinct materials. These are known as wool and kemp. The wool is soft, beautifully rich, superior even to the finest Continental lamb's wool, and is divisible into distinct qualities. The kemp is a coarse, rough-looking hair, and is constantly avoided by the manufacturer, as the smallest admixture of it with the wool gives the fabric an appearance of coarseness, through its harshness. Intermingled as these two wools are with each other when shorn from the goat, it becomes a matter of great difficulty to separate the one from the other, and, as there is no mechanical invention for doing this, it has to be effected by hand, and this is done fibre by fibre, a difficult and tedious process. To have done this in the ordinary course of trade would have entailed an expense of no ordinary chracter; but it was no sooner known in the woollen districts of Yorkshire, that the Prince desired that an experiment in the manufacture of the wool from his goats should be made, than there were hundreds of volunteers to do the preliminary work of separating the fine from the coarse hairs; and from the highest to the lowest in station, all set about their work earnestly, under the direction of Messrs. Haley and Messrs. Gregory; and the only remuneration given, or required, was an elegantly engraved certificate, with a view of the Crystal Palace as an ornament, stating that the holder had been employed in forwarding the experiment of the Prince in the manufacture of Cachmere wool; and it is a singular fact, that for some months upwards of 1000 persons of all grades were so employed, according as their leisure enabled them to devote attention to this "labour of love."

In the manufacture of the shawls considerable difficulty arose, from the impossibility of again dividing the small quantity of wool produced in order to make warp and weft yarns, so that the fabric is not so fine as might be expected, or indeed as appears in the dress goods where the warp is composed of silk. The white shawl, however, has a very delicate appearance in colour, and the extreme fineness of material is easily seen on examination. The dress goods will attract most attention from the lady visitors; but then it must be remembered that they are only partly composed of the Cachmere wool, the warp being of silk. The white dress is very elegant in its appearance, the pattern being of the wild strawberry, prettily put together to form a "trail." The larger pattern of the coloured dress is not so good, though the effect is broad, for it appears to have been elongated in the weaving. The dresses are the production of Messrs. Gregory, and the shawls are manufactured by Messrs. Haley, who have also wrought up the "kemp" into the specimen of coarse woollen cloth placed in the centre of the display; and as this latter is produced from a material hitherto considered worthless, and by that means making use of the whole produce of the goat, these gentlemen are deserving of all praise for the manner in which they have seconded the efforts of the Prince in this matter, through the medium of Mr. Pollock, of Leeds, who interested himself largely in the experiment.

How far the manufacture of Cachmere wool may prove of value in an economic point of view, remains to be seen; but the present experiment is not the less interesting because the ultra-utilitarian may consider it will not "pay." Under any circumstances, the greatest credit is due to the Prince for promoting the present attempt; and had it done nothing more than prove the earnest feelings entertained towards him by those engaged in the preliminary labour of assorting the wool, it would have been a source of gratification to every loyal subject.

THE ZOLLVEREIN DEPARTMENT.

The Engraving standing across the eighth and ninth pages gives a comprehensive view of that portion of the East Nave (looking west) appropriated to the Zollverein Department, the courts of which branch off right and left. The large tent-like object bounding the foreground is the tent containing the famous Dante window from Milan; the equestrian statue to the rear is the colossal Godfrey de Bouillon; and in the foreground are the Amazon, by Kiss, of Berlin, and the Bavarian Lion, which we shall take occasion to speak more fully about in a future number. Around are various objects of Sculpture, which have been very liberally contributed by the States belonging to the Zollverein.

heat, each needle is straightened by giving it a tiny blow with a tiny hammer on a small steel anvil. This process is necessarily tedious. It is called the "hard straightening."

The needles, though now properly tempered, are still rough and unpolished on their surface: to obviate this, and make them bright, is the next of the series of operations. The process is termed the "scouring." A strip of canvass is laid on the table, and an immense number of needles are placed on this, all parallel to one another; a pretty large allowance of soft soap, sweet oil, and powdered stone found in the neighbourhood of Redditch, is then placed over them, and the whole tightly wrapped and corded up into shape. A considerable number of these bundles being prepared, they are placed beneath a moving table of wood, working to and fro in a wooden bed. The needles by this means are rubbed one against another, until, in process of time, they are smoothed and partly polished on their surface. After being subjected to the action of this machine, the rolls are untied, and the needles washed: they are then replaced in the canvass, and tied up with a fresh supply of soft soap, oil, and emery, and subjected to the action of the scouring machine. This is repeated several times, till they are perfectly smooth. After being washed for the last time, the needles are placed among some dry saw-dust, and worked to and fro in a peculiarly-shaped copper tray till they are all perfectly dry. At this stage a very curious operation is observable: the needles being mixed up with the saw-dust, it becomes a matter of importance to separate them with rapidity; this is effected in a manner as simple as it is effectual. The tray in which the needles and saw-dust are placed tapers up to an edge, which has no margin, thus affording a place over which matters can pass without obstruction. The workman moving the tray rather rapidly up and down, causes the needles and saw-dust to approach the edge: the saw dust being lightest, flies off, the needles remain; but such is the dexterity of the workman, that, although the needles are seen glancing half over the edge, still it is an exceedingly rare occurrence for one to pass completely over: thus in less time than we have taken to write the above half dozen lines, the workman can separate thousands of needles from their attendant saw-dust. As may be supposed, the needles from this rough proceeding are lying in all imaginable positions. To make them parallel to one another is the next operation. This is easily effected by placing them in an oblong tin tray, and giving it a peculiar shake, in a remarkably short space of time some thousands are parallelised. But, although they are parallel to one another, still they are wrongly situated for subsequent operations: the head of one may be next to the point of another; it is necessary that the heads of all should lie one way, the points another. To attempt to do this by singling out each individual needle, would be a hopeless task where millions have to be operated upon. By a very simple contrivance—we may say machine, for it saves labour—the operation is effected most rapidly. A small piece of linen rag is wrapped round the forefinger of the operative, and, placing a few thousands of the parallelised needles before her on the table, she passes the covered finger along one side of the heap, the finger of the other hand on the other side; the needles having their points at one side stick into the linen rag: these are placed by themselves. In this way all the needles with their heads lying one way are left by themselves.

The next operation is "drilling" the eyes. From the nature of the operation of "punching," the holes are rather rough and uneven: it is to remove this, and to countersink the holes, so that the sharp edges may be taken off, that the operation of drilling is gone through. As the needles by this time are hard, they have to be softened by the application of heat, so that the drill may not be spoiled by the hard metal. For this purpose a number of needles are placed upon a bar of iron, with their heads projecting over the edge a short distance: these are then applied to a red-hot bar, which reduces the temper of the needles, causing the head to assume a beautifully blue colour: this process is called the "blueing." A number of the blued needles are next taken by the driller—generally a little girl—and placed behind a flat steel bar, with their heads projecting slightly above its upper edge. The operative sits exactly in front of a little drilling-lathe, in which a small drill is placed, and made to revolve rapidly. The needles are brought one by one before the point of the drill: the drill not only cleans out the eye, making it internally smooth, but it also countersinks the outer edge of each. Some idea of the extreme nicety of the operation may be obtained, when it is remembered that the variation of a hair's breadth in the presenting the eye of the needle to the point of the drill would result in the complete spoiling of the article; yet such is the amazing rapidity with which the drilling proceeds, that a dozen will be drilled in as many seconds; in fact, it is difficult to believe on first witnessing the operation, that the needles are really drilled.

The needles are then taken to the polishing-room, where they are beautifully polished by being held to the periphery of revolving wheels, covered with buff leather. The needles are taken up in a dozen or so at a time, and first held by the points and the upper ends, then by the heads and the pointed ends: the whole surface of each needle is thus rapidly polished. They are next counted and put up in little blue papers, twenty-five in each, labelled, and tied up in bundles for sale. We have thus briefly traced the manufacture of a needle from its rough state to its final condition, which includes no less than seventy distinct processes.

There are fourteen exhibitors of needles in the Crystal Palace, ten of whom are British manufacturers, one from France, one from Austria, two from Aix-la-Chapelle, in the last case the raw material is stated to be of English origin.

AGRICULTURAL MACHINES AND IMPLEMENTS.

THE collection of agricultural machines and implements in the Great Exhibition are daily examined with great interest, not only by tenant farmers and the proprietors of the soil, but by the community at large.

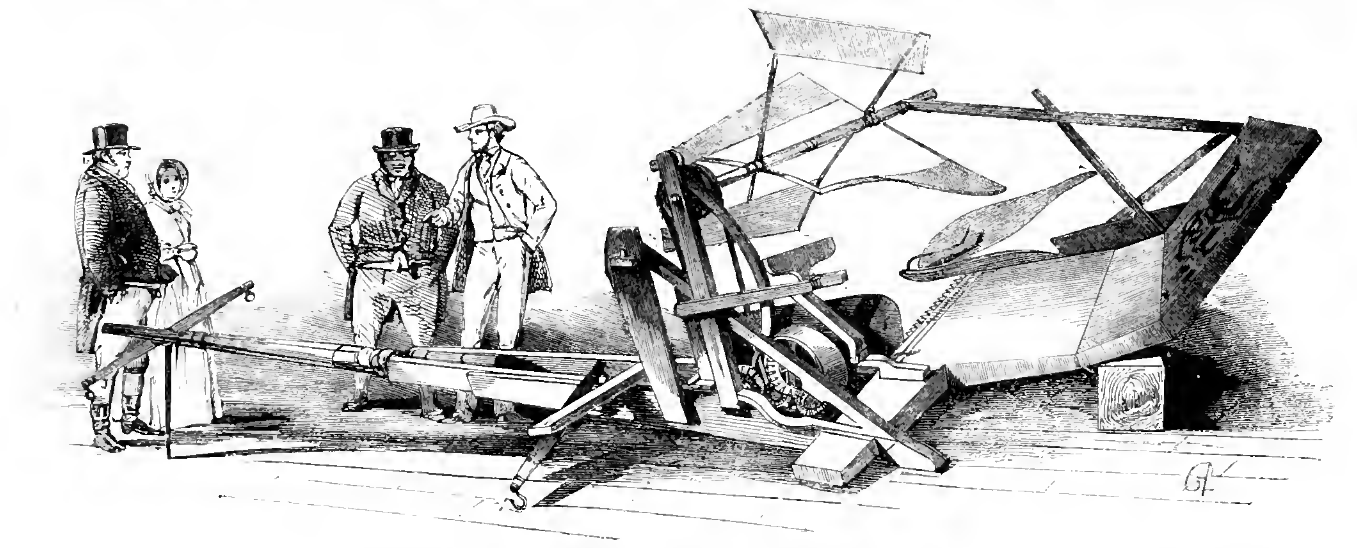
The space devoted to this department on the south-west side of the Building is about 650 feet in length and nearly 50 feet in width. The whole of this extensive area is covered with ingenious mechanical contrivances for facilitating the various operations of agriculture, such as reclaiming swamps and bogs, and converting them into salubrious and fruitful fields; for digging, pulverising, and disintegrating the soil, so as to produce the finest tilth; for depositing manure and seed with the exactness and certainty of the human hand; for eradicating and destroying weeds; for the housing the crops with safety and dispatch; for the preparation of the produce for market, and the converting that produce into proper food for man and animals. In every department of these, the various operations of the farmer, will be found an infinite variety of machines, calculated to assist him in their better, quicker, or more economical performance, for every description of land, whether wet or dry, light or heavy, on the level or hill-side—every circumstance has been provided for, exhibiting an amount of ingenuity, theoretical and practical study, not exceeded in any other department in the Building.

The design and construction of agricultural implements has in the last few years made the most rapid advances, creditable alike to the farmers who have patronised and constructed, and to the manufacturers who have invented them.

To the house of Ransome and May, of Ipswich, agriculturists are much indebted, for they were among the first who made the great move in the better construction of the implements of husbandry, by the judicious substitution of iron for wood in the frames of field implements, and in the better construction and fitting up of the working parts. A few years ago, the ordinary implements of the farm consisted only of some wooden-framed, unwieldy ploughs and harrows, and an equally clumsy wooden roller; and, in many old leases and agreements, will be found a covenant that the landlord is to supply plough timber, by which was understood wood for the construction and repair of the tenant's stock of agricultural implements. A farmer now, glancing at the long array of beautiful machinery exhibited in Class 9, would not be slow at discovering that an unlimited quantity of plough-wood would do but little towards supplying him with a stock of such elaborately-wrought machines as those before him. A person unacquainted with the merits of the various implements here exhibited, would be sure to imagine that too great a sacrifice had been made to show, and that the machinery exhibited could never bear the rude shocks and violent strains to which this description of machinery is subjected. To foreigners this effect must be particularly striking; for, as compared with similar implements exhibited by them in their several departments, our own must appear so light as to be almost useless. The reverse of this, however, is really the case: for nearly all these implements have been subjected to the severe tests of the Royal Agricultural Society's appointed judges; and, although some will be found better than others, there will be but few that do not possess some good qualities, and scarcely any that can be considered as actual failures.

The agricultural machines and implements exhibited in the foreign departments also come in for a considerable share of attention, which is well deserved. The largest number of contributions of this kind are in the department allotted to the United States of America. They consist of a large number of ploughs, of various kinds, but all having one strong family likeness, being remarkably heavy in appearance, full breasted, high framed, and having the stilts unusually short and elevated, with the holding part inclined at a flatter angle. In addition to ploughs, there are horse-hoes, grubbers, cultivators, and drills, and two specimens of remarkable-looking machines for reaping corn.

In the Belgian department are a number of implements, some possessing considerable merit. They consist of the usual kinds of grubbers, land-pressers, horse-hoes, drills, and some ploughs. In the department of France we observe a wool-cleaning machine, and some specimens of corn-mill. Denmark exhibits a large well-made chaff-cutting engine. Switzerland sends a double plough, and some good specimens of dairy utensils. Austria sends scythes, reaping-hooks, &c. In the department allotted to British possessions abroad, are some wooden framed ploughs, very similar, as may be expected, to those exhibited by the United States. In the same department are specimens of hay and manure forks, scythes, and malt shovels.



M'CORMICK'S AMERICAN REAPING MACHINE.

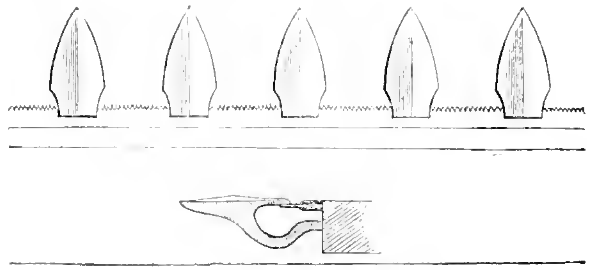
We now proceed to notice in detail some of the most striking objects exhibited, commencing with

M'CORMICK'S (AMERICAN) REAPING MACHINE.

Rude attempts at reaping machines were made by the Romans, and numerous ingenious contrivances have been introduced at various times since, both in Great Britain and on the Continent; but at the present time there is not one in ordinary use in England. The general fault of the machines hitherto constructed is that they will only cut the corn when it is in first-rate condition, the straw being erect, and the ground exceedingly even.

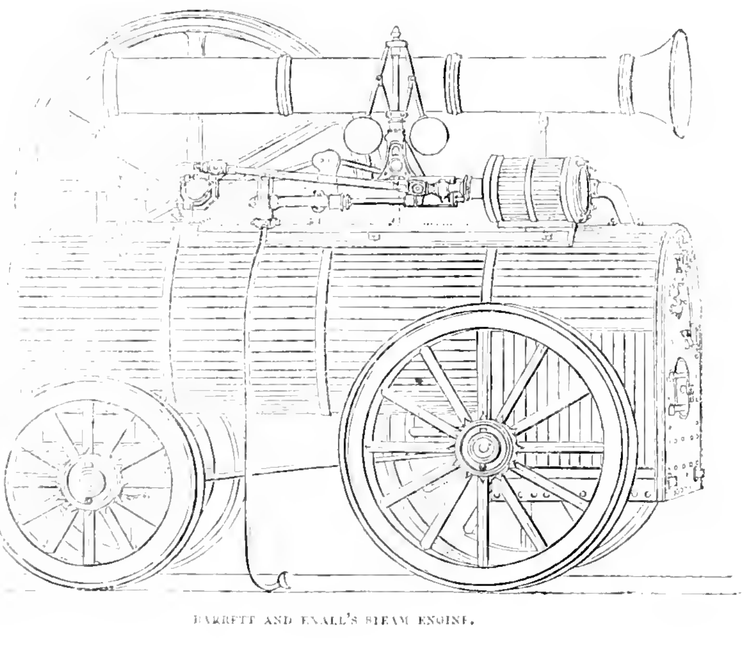
Two methods have been adopted in the various attempts at reaping machines—the one to cut by a series of clippers or shears, and the other by a revolving plate. The latter plan was adopted by the late Mr. Smith, of Deanston, in 1811, and was improved and used until about as late as 1837, but has now entirely disappeared. The machine that has been the most successful was the invention of the Rev. Patrick Bell, of Forfarshire, and a premium was awarded him by the Agricultural Society of Scotland in 1827. It cut a breadth of five feet, and did its work exceedingly well; but, from the defects before alluded to, it has not come into general use.

The subject of the present Engraving is the invention of C. H. M'Cormick, Esq., of Chicago, who has already received the gold medal of the American Institute for it. The principle of the cutting action is shown in the diagram, and consists of a cutting blade about an inch in breadth, slightly toothed on the front edge, and extending the whole length of the breast of the machine, a quick reciprocating motion being given to this by a crank. The straw, as the machine moves round, passes into the space between the projecting fingers, and is sawn off by the action of the cutter. Directly over the cutting-blade is a light reel, with flat transverse blades of deal, set at a slight angle with the front of the machine, revolving as it moves round, and holding the straw firmly between the fingers and against the blade while being cut. When the corn is cut, it falls upon the floor of the machine, and is removed to the land again by a man who sits on a saddle-shaped piece of the machine and is carried forward with it.



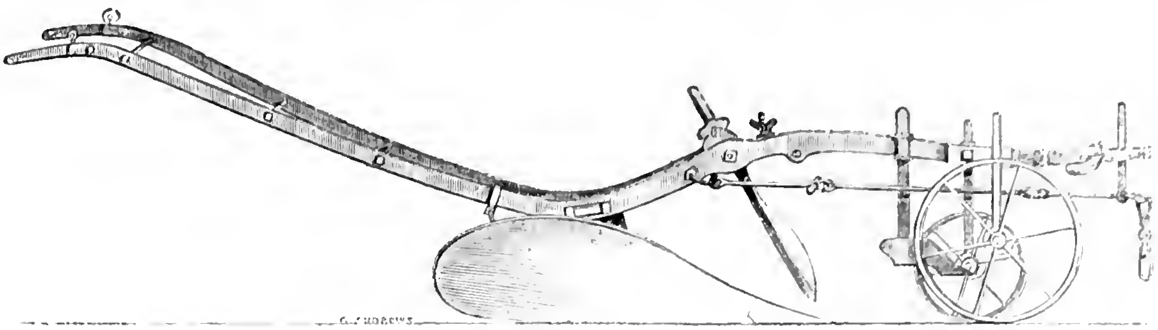
CUTTING KNIFE OF M'CORMICK'S REAPING MACHINE.

We copy the following description of its extraordinary cutting powers from an American paper devoted to agricultural subjects, called the



BARRETT AND EXALL'S STEAM ENGINE.

DEANE, DRAY, AND DEANE'S DOMESTIC FLOUR MILL



HOWARD'S PATENT PLOUGH.

Cultivator,—"The machine cuts all the grain; and if the raker is careful, none is scattered; and if the binders carry a rake and use it, none need be lost. Fields harvested by these machines have a beautiful appearance. The stubble is uniform in height, while no prostrate, scattering straws speak of waste. If the binders have felt at all interested in doing their work well, there is nothing to glean with the sickle, bagging hook, or rake. Weeds, brush, pitchforks, rakes, if standing in the way, or even horses' legs, are all cut smooth alike."

To this valuable machine the gold medal has been awarded.

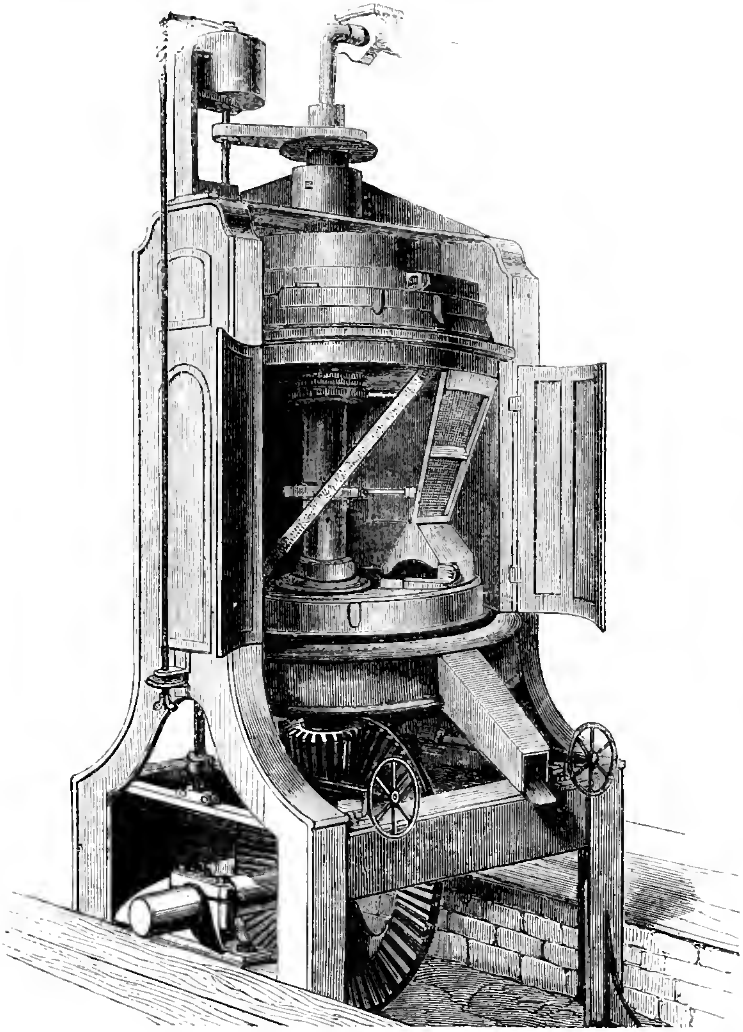
BARRETT AND EXALL'S STEAM-ENGINE.

Barrett, Exall, and Co., of Reading, exhibit a portable steam-engine, a striking peculiarity of which consists in placing the cylinder and the whole of the engine part upon a metal frame, which is complete in itself, independent of its attachment to the boiler, and renders its removal easy at any time it may be necessary, without affecting the other part, and a much steadier action is also produced while working. This engine is well adapted for all purposes connected with agriculture, as well as sawing, pumping, &c.; and, as its consumption of coal is not more than 7 lb. per horse-power per hour, and any smart man on the farm may, with a month's practice, be safely entrusted to work it, there can be no question about the economy of using it. This production has had a prize medal awarded to it.

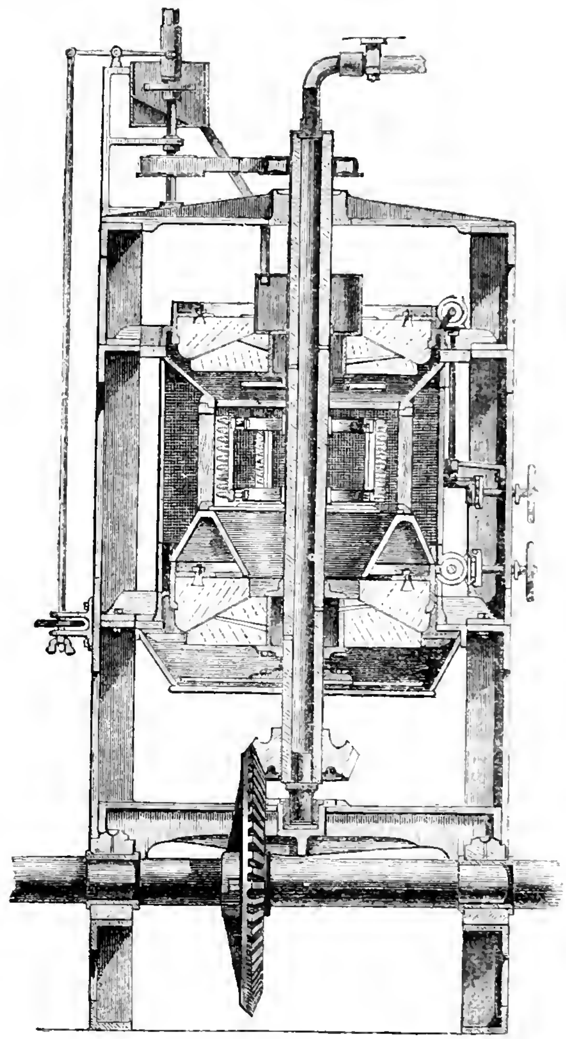
DEANE, DRAY, AND DEANE'S DOMESTIC FLOUR MILL.

This is an excellent little machine and does its work in a very superior manner, the flour being perfectly soft and fine as from a large mill. It also dresses and separates the flour, seconds, and bran, at the same time, and in such a manner as we should not have expected in so small a machine.

Messrs. Deane, Dray, and Deane seem to have succeeded in producing that which has long been a desideratum, namely, a good and effective hand corn-mill, for occupiers of small holdings and emigrants.



WESTRUP'S CONICAL FLOUR MILL.



SECTIONAL VIEW.

MESSRS. HOWARD'S PATENT PLOUGHS.

MESSRS. HOWARD'S new patent ploughs are made principally of wrought iron, and are an improved form of their prize ploughs, which are known throughout the kingdom: the Royal Agricultural Society of England, having, since 1841, awarded to Messrs. Howard nine first prizes for exhibiting the best plough at their annual meeting. The exhibitors show a set of ploughs of three sizes, marked for distinction X—XX, and XXX, suitable for ordinary, deep, and extra deep ploughing. The improvements consist in a greater elegance of design, more equal proportions, and the cutting and moving parts known as the share and furrow-turner being formed upon exact geometrical principles. The curve being regular and taper, the power required to work the implement is considerably lessened; and the furrow slice travelling at an uniform rate from its being first cut until left in its final position, the furrows are laid more even, and in the best form for the reception of the seed. A novel method is introduced of fixing the shares to lever necks of wrought iron, the raising or lowering of which gives the point greater or less inclination as the state of the land may require. The action and fixing of this lever neck is most simple, and altogether new. The centre pin, upon which the lever works, is of steel, and fixed to the neck; the lever when raised or lowered (which can be done instantly) is secured in a series of grooves by a screw-nut at the end of it: the iron being thus brought into a state of tension, ensures firmness, as well as increases the strength. Another feature in these ploughs is a new mode of fixing the wheels and making the axles. The holdfasts, or clamps, securing the wheels, are made to slide through a mortise formed in the beam, by which the width may be altered with greater facility, as well as dispensing with the old sliding axle, which was an obstacle in deep ploughing, and objectionable upon dirty land on account of the soil accumulating round it: the wheels, by the method now adopted, are brought opposite to each other, and the land-wheel may be expanded as well as the furrow-wheel. The axles are similar to a patent axle—an essential improvement, as no grit can get in nor any grease escape: the wheels, therefore, must wear much longer, and the friction is considerably reduced. A most simple method of adjusting the coulter is adopted, by which any required position is instantly obtained, thus preventing much loss of time, which was the case upon the old plan of fastening by wedges. The draught, as will be seen from the illustration, is from the nearest point to the centre of resistance, thereby removing a great portion of strain on the beam.

Every part is so arranged, that a ploughman can remove or replace the irons, subject to wear or breaking in the field, without the assistance of a mechanic: and they can be worked either with or without wheels, or with one, as required, and each plough is furnished with a set of furrow-turners of various sizes, more or less curved.

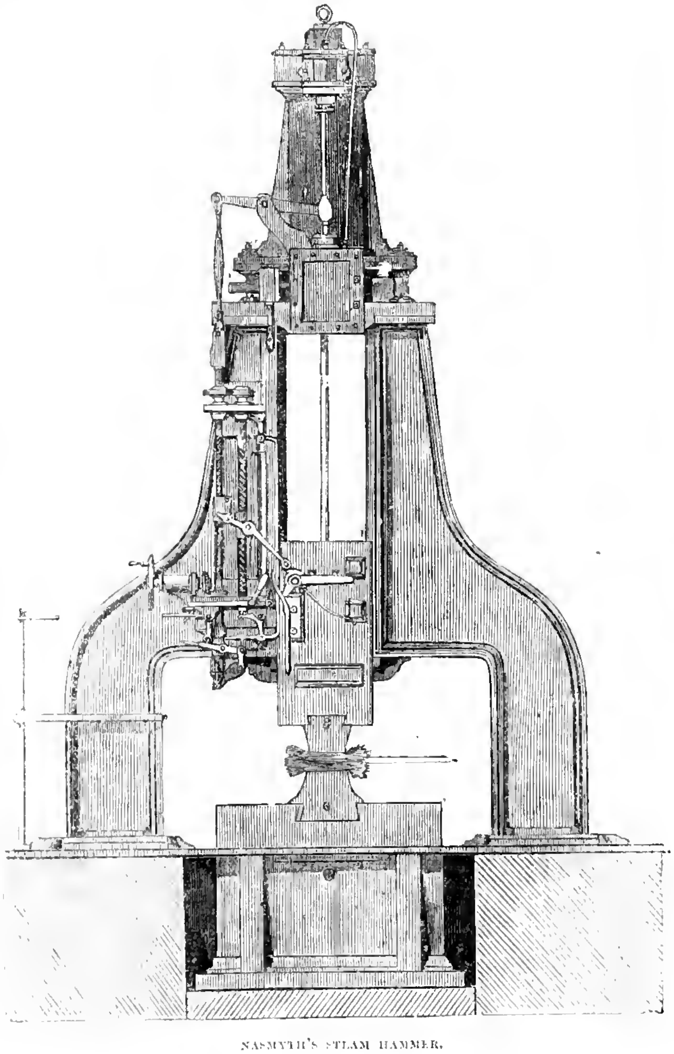
WESTRUP'S PATENT CONICAL FLOUR MILL.

IN presenting our readers with the subjoined plan of Westrup's Patent Conical Flour Mill, we think it necessary to remark, that for the last three centuries our best mechanical millwrights and engineers have been seeking some better method of grinding wheat than by the use of the antiquated horizontal mill-stones. These stones are most of them from four to five feet in diameter; and wheat passing between them, in the operation of being ground into meal, is subject to such an amount of heat by pressure and friction, as to extract from it by evaporation a very considerable portion of its nutritious qualities: the stones being horizontal, the delivery of the meal from them after grinding can only be effected by the extreme velocity with which the upper stone revolves. Under the disadvantageous circumstances in which our older millers have worked for so many years, we cannot but hail an invention, as effective as it is simple, which completely provides against the evils which the old system is subject to. The improvement we refer to is the adoption of conical stones in lieu of horizontal ones, with a working surface of only eight inches instead of two feet. By the first pair of stones the wheat is broken and delivered in a state of half-ground meal, unheated; and, by the natural laws of gravity, the flour is instantly passed through a wire cylinder, fixed beneath, by the aid of brushes fixed upon the same shaft as the stones. The flour being thus instantly separated from the unground meal, the latter passes down to the second pair of stones, also fixed upon the same shaft, and the grinding is then completed. Moreover, we cannot refrain from expressing our admiration of the concise and beautiful adjustment of the stones, as being on a good sound principle. The lower, or running stones, are keyed upon the shaft, whilst the upper or stationary stones drop into a turned ring, and necessarily rise and fall upon four inclined planes, and are capable of regulation to the utmost nicety, thereby wholly relieving the wheat from any weight or undue pressure during the operation of grinding, whilst the weight upon the old system is equal to three-quarters of a ton. Another feature of paramount importance is, that the conical mill can be driven by less power than is required to drive the horizontal ones, the former producing double the quantity of work in the same period of time. We have perused certificates from several respectable bakers who have used the flower produced by this method, which state that a sack of flower manufactured by the conical mill will produce from two to three 4 lb. loaves more than that which is made by any other mode of manufacture yet introduced, and they attribute this increase to the greater quantity of gluten and nutritious qualities retained in the flour from its being so much less heated, the wheat passing over such a small surface of stone. These data, which have been most satisfactorily established, induced us to calculate the advantages that might be derived were this improved method of manufacture to be generally adopted. Taking the population of London to be 2,500,000, and inferring that each person consumes annually, according to the last statistics, the produce of a quarter of wheat, which is about 382 lb. of flour, and that this mode of grinding will produce three 4-lb. loaves more to the sack than the old method, there will be for London alone a gain of 10,232,142 4-lb. loaves from the same quantity of wheat. Again, taking the population of England at 20,000,000, and valuing the 4-lb. loaf at sixpence, and calculating upon the increase of three loaves to the sack, there will be a gain to the country at large of the enormous amount of 2,046,428*l.* per annum—a sum about equal to half the Income-tax as at present levied.

This mill has been exhibited before her Majesty and his Royal Highness Prince Albert, in a private apartment in the Exhibition. The side cuts represent the safety lever, seen from above and at the side; *d* is the lever, acting through the pieces *a* and *f* on the roller *c c*; *c* is a tightening screw.

MACHINES AND MECHANICAL CONTRIVANCES.

UNDER this head we shall notice from time to time, either in groups, or individual instances, the principal mechanical appliances exhibited in the Crystal Palace. In pursuing our labours, we shall not attempt to follow the Official Catalogue, in the classification of machinery into half a dozen subdivisions, beginning with "machinery for direct use;" considering that so doing would only tend to confusion and mystification, rather than any practical good result as regards that most important point, facility of reference. We consider the terms "machines" and "machinery" to be well understood, and so comprehensive as to include every engine or implement, which conveys, in a modified form, power, whether animal, or artificially produced, applied to it.



NASMYTH'S STEAM HAMMER.

It may be proper to add, in our treatment of science and the useful arts, that building, and engineering, and philosophical instruments will form distinct heads. Agricultural implements and contrivances will also be treated in a class by themselves.

NASMYTH'S STEAM HAMMER.

Perhaps there is not on record an invention which has introduced itself into such extensive use in so short a time as Nasmyth's extraordinary steam hammer. One of these powerful engines, of the size most in use, is exhibited in the southern division of the Machinery department of the Great Exhibition, not far from the Britannia hydraulic press; but it is much to be regretted that this most useful engine is not shown at work, neither is there any account of it in the official and illustrated Catalogue. Since 1842, in which year Mr. James Nasmyth took out his patent, not fewer than 380 of these powerful and manageable machines have been constructed and distributed in all quarters of the globe. In many of the large engineering establishments around London, we find even three and four called into requisition; and we advise those of our London readers who have an opportunity of visiting any of the respective establishments of Messrs. Maudslay and Field, Lambeth (who have three hammers of the respective weights of 30, 15, and 5 cwt., for different kinds of work); Penn and Son, Greenwich; Blyth and Co., and Seaward and Co., Limehouse; Miller and Ravenhill, Blackwall; and last, though most important of all, the highly interesting and extensive iron ship-building establishment of Messrs. J. C. Mare and Co., at the Orchard House, Blackwall, to lose no time in seeing the extraordinary operations performed through the instrumentality of the steam hammer, requiring for itself the attendance of one person only. The accompanying Engraving represents an elevation of the hammer, which for this, the most useful size, weighs only 30 cwt.; but the most gigantic machine of the kind which has yet been turned out is that at Messrs. Mare's large works, having a hammer of 6 tons weight, with a stroke of 6 feet. On a recent visit to this establishment, we found one of those ponderous and apparently unwieldy paddle-wheel shafts for a pair of marine engines, building by the celebrated firm of Maudslay and Field; this shaft, which had been entirely formed by the giant hammer "Thor," occupied upwards of three weeks from its commencement to its completion: it is of the extraordinary weight of $16\frac{1}{2}$ tons, and 27 feet 9 inches in length; yet, by aid of a powerful crane, the operation of welding and forging this large mass is rendered as simple and easy as that of a horse-shoe in the hands of a country smith. Messrs. Mare and Co. have also three other Nasmyth hammers, each decreasing in power to suit various kinds of work. Referring to the hammer contributed to the World's Fair, we find the anvil, which is chiefly buried below the floor, weighs eight tons; the hammer itself, already mentioned, and which is suspended from the piston rod, $1\frac{1}{2}$ ton; the piston which works in the cylinder, placed at top of the machine, is of 16 inches diameter; and the extreme fall of the hammer, or what in steam-engines is usually called the stroke, is equal to 42 inches. The ingress steam pipe is of two inches diameter, the pressure of steam usually employed being equal to 40 lb. on the square inch. The hammer being on the self-acting principle, every degree of blow, from that of merely cracking an egg-shell to that of a dead pressure of 500 tons, is attainable. The whole width of the frame at the level of the floor is 11 feet; and the space between the legs in which the top of the anvil is placed is 7 feet; the height of the machine being about 15 feet. The frame is bolted down to large iron plates let in flush with the floor; but if the hammer at the Exhibition had been intended to have been shown in operation, a much stronger foundation would have been required. By admitting the steam under the piston, the hammer is elevated to the desired height; and by its own gravity the hammer falls: but the fall may be instantly eased, if desirable, by the admission of steam, according to the particular kind of blow required. In ordinary work, as many as seventy blows are given in a minute.

In the former part of this notice we mentioned the large engineering establishments in and around the metropolis, at which the steam hammer may daily be seen fulfilling its appointed duties; but at all the principal anchor-makers, at all the large engine builders, and at the principal railway manufacturing establishments in the kingdom, the making up of iron, either from scraps, old rails, hoops, or from the pile, is also effected by means of the Nasmyth hammer.

From a statement of iron made by the use of this machine at the North-Western Company's manufacturing establishment at Crewe, in six months ending June, 1851, we find that upwards of 176 tons of iron, in the shape of tires, axles, &c., including a shaft for a stationary engine, was made; and that, after deducting the cost of wages, scrap iron, and coals, there is a clear profit of upwards of 2300*l*. Nothing can be more convincing of the utility of this engine than the above fact. Before the introduction of this adjunct to the smithy, the forging of the large marine engine shafts was not only a tedious but an uncertain process; and many an accident which has occurred to the ocean steamers might have been traced to the imperfect forging of the iron; for, without blows of sufficient energy, it is impossible to expel the scoriæ from between the bundles of iron rods, which, as in the United States, they attempted to weld together to form their main shafts.

It is quite impossible to say to what uses Nasmyth's last invention will hereafter be applied. At the present time, however, in addition to the formidable kind of work for which it has hitherto chiefly been employed, its application to the stamping out of dish covers, and the moulding and forming of silver plate, is now in progress.

It is curious enough, in looking over the specification of James Watt, to discover that he had thought of using a hammer in connexion with the power of steam, but had never worked out the really useful mode of applying the hammer, viz. that of attaching it to the piston rod itself. This important step was left for the genius of one of our own times practically to carry it out. It is in Watt's patent of April 28, 1784, that we find the following:

"My fifth new improvement consists in applying the power of steam or fire engines to the moving of heavy hammers, or stampers, for forging or stamping iron, copper, and other metals or matters, without the intervention of rotative motions or wheels, by fixing the hammer or stamper to be so worked either directly to the piston or piston rod of the engine, or upon or to the working beam of the engine, or by fixing the hammer or stamper upon a secondary lever or helve, and connecting the said lever or helve, by means of a strap or of a strong rod, to or with the working beam of the engine, or to or with its piston or piston-rod."

BIDDELL'S PATENT SELF-REGULATING GAS-BURNER.

The difficulty of maintaining a uniform flame in the ordinary gas burner is well known, not only to the manufacturer of burners, but also to the consumer of gas. To remedy so glaring a defect in artificial lighting, has long been a desideratum: and it was left for Mr. Biddell, of Ipswich, to accomplish so great and valuable an improvement: and the mode in which he has accomplished this is by the most philosophical means.

The inventor had in view, when he first proposed to remedy the defect already alluded to, the compensation pendulum of a clock, whose true length is preserved, notwithstanding the alternation of heat and cold to which it is continually subjected.

Thus Mr. Biddell introduces into the centre of the burner a vertical compound rod of about $\frac{1}{4}$ inch diameter, consisting of brass and steel, the cylindrical case being of brass, and the core within of steel. By the expansion and contraction of this rod which is surrounded by the flame, a small lever and simple valve, in connexion with the bottom of the rod, is acted upon so delicately that the exact amount of gas required to preserve uniformity of flame is regularly preserved.

CHAUCER AND THE EXHIBITION.

Chaucer, it would seem, possessed a prophetic faculty in his prefiguration of this Palace of Glass. The passages we quote occur in the "House of Fame," in the introduction to which the poet describes it as a vision and speculates upon the causes of dreams, affirming his inability to decide whether—

"Spirits have the might
To make folks dream o'night;
Or if the soul of proper kind
Be so perfect as men find
That it wote what is to come."

"As I slept," he goes on to say—

"I dreamt I was
Within a *temple made of glass*,
In which there were more images
Of *gold* standing in sundry stages,
In more rich tabernacles
And with *jewels* more pinnacles,
And more curious *portraitures*,
And quaint manner of figures
Of gold work than I saw ever.

* * * *

Then saw I stand on either side,
Straight down to the doors wide
From the daïs many a pillar
Of metal that shone out full clear.

* * * *

Then gan I look about and see
That there came ent'ring in the hall
A right great company withal,
And that of sundry regions
Of all kinds of conditions
That dwell in earth beneath the moon,
Poor and rich.

* * * *

Such a great congregation
Of folks as I saw roam about,
Some within and some without,
Was never seen nor shall be no more!"

So palpable a coincidence is, to say the least of it, very curious.

Lead Mines on the San Saba.—The *Houston* (Texas) *Telegraph* mentions having seen some very valuable specimens of lead ore, which were brought from San Saba. There are immense quantities of it, and hundreds of tons may be obtained with little labour. This ore contains a large portion of silver, and it is quite probable that the old Spanish mines which were worked for silver near the old fort on the San Saba resemble this. The settlements are rapidly extending towards the region where this ore is found.

The American department has received an important accession of strength in the shape of some specimens of Brussels carpet, woven upon power looms. Although various attempts have been made to adapt the power loom to carpet weaving in this country, there is not, we believe, any machinery perfected for that object. Our American brethren have, therefore, gained another step ahead of us, and have won another laurel on this well-contested field of the industrial arts.

Australian Gold.—The first specimen of Australian gold arrived on Thursday, *viâ* Singapore, and was exhibited in the Jerusalem Coffee-house. It seems of good quality. The gold ore in the Exhibition is from South Australia.

COLOSSAL STATUE OF THE QUEEN, IN ZINC.

This statue, which represents our gracious Sovereign seated upon the throne, arrayed in all the attributes of royalty, is an appropriate compliment from the Vieille Montagne Zinc Company, of France and Belgium, to this country, in commemoration of the Great Exhibition of all Nations. Its production also affords an instance of extraordinary energy, having been, we are informed, "commenced and brought to its present state within the short space of three months." The statue stands, with the pedestal, 21 feet high. The design and modelling are from the hands of M. Dantan, *aîné*, of Paris; the etchings of the pedestal by M. Lenormand, architect, and produced by M. Hardouin. The statue was cast under the immediate inspection of M. Victor Paillard. Independently of all consideration as a work of portraiture, this is a remarkable production, and deserves attention.

Trial of Bazley, White, & Sons' Cement.—During Saturday, and again on Monday afternoon, the beam of hollow bricks and Portland cement, constructed by Messrs. Bazley, White, & Sons, at the western extremity of the building, underwent a trial of strength, which attracted a good deal of attention. This brick beam was identical in size with that of common bricks and Roman cement constructed at Nine Elms in 1836, and which, after standing eighteen months, was broken down by a weight of 50,652 lbs. Its dimensions were 21 feet 4 inches bearing between the piers, 2 feet 3 inches in thickness at the bottom of the beam, and 1 foot 6 inches, at the top, the height being 4 feet 2 inches. The layers of hollow bricks, besides being joined with Portland cement, were held together by thin bands of iron passing through them, and the whole has remained standing since the opening of the Exhibition, with an announcement attached that it would be weighted and broken before the close. On Saturday the supply of pig iron provided for this purpose failed, and the experiment was renewed on Monday, in the presence of Dr. Ansted, Mr. Godwin, General Pasley, and others interested. When the load placed on the beam had been increased to 62,800 lbs., a crack was observed running right up the centre, and two others at equal distances on either side converging towards the centre as they extended upwards. Then the abutments were thrown out of the perpendicular, one to the extent of a foot, the other an inch and a half. Finally the beam broke right in half, the experiment terminated in the most satisfactory manner for the reputation of hollow brick constructions and Portland cement. It may be stated as a curious fact in connection with this supposed new species of building material, that the use of hollow bricks was well known to the Romans, and that in Tunis, at the present time, they are in constant requisition. It was originally intended by the Bey to send over specimens, but the interest of such a contribution was at the last moment accidentally overlooked.

COLOSSAL STATUE OF THE QUEEN, IN ZINC.

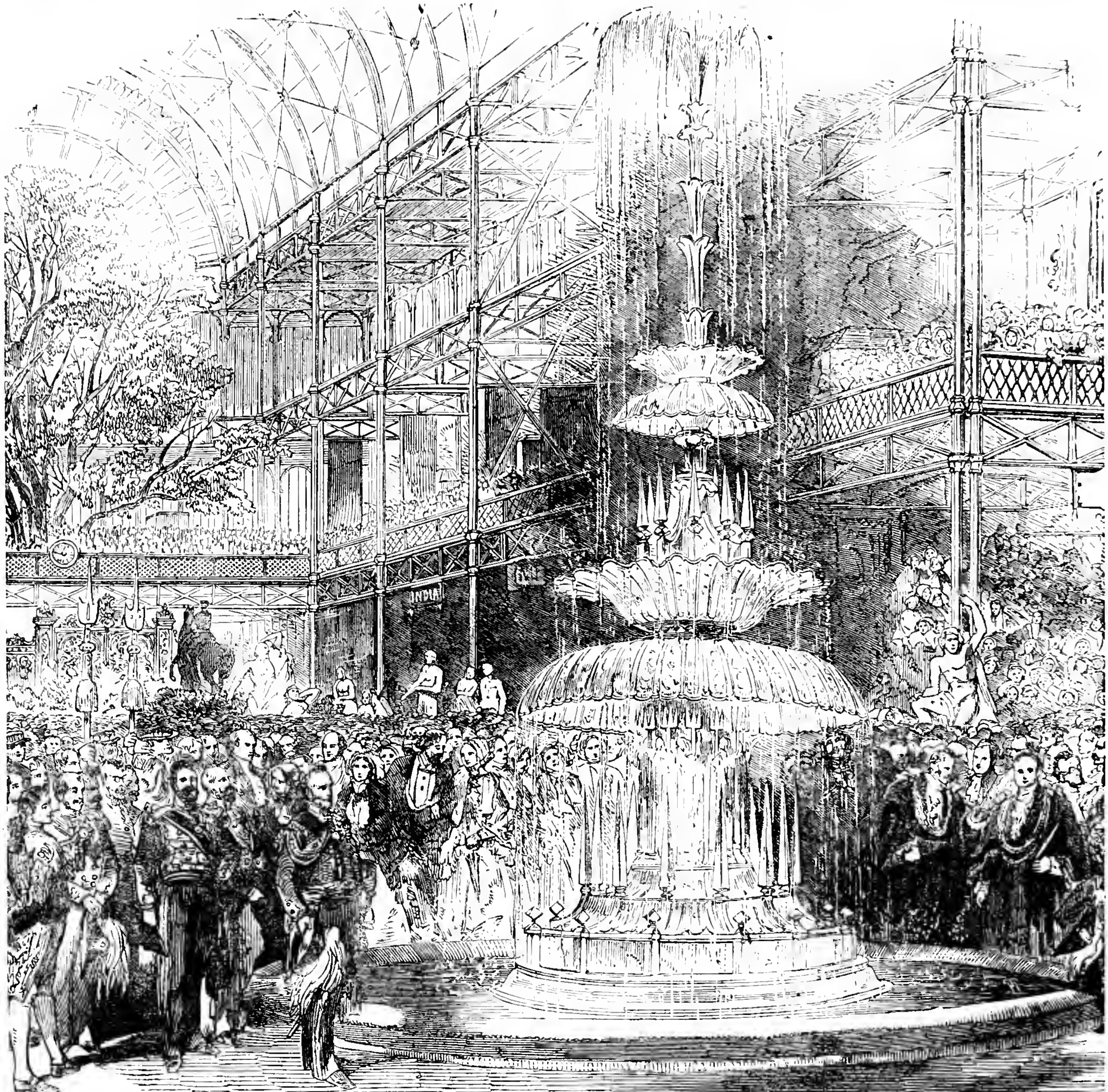
Visitors to the Great Exhibition.—The shortening days abridge gradually the time during which the building remains open, and now, instead of closing at six o'clock, spectators are rung out ten minutes before sunset. Yet the interest continues unabated, and the desire of the public to visit this storehouse of the world's productions is no longer a movement of curiosity, but an impulse spreading through the length and breadth of the land, and drawing people together from the remotest portions of the kingdom. It may be mentioned, as a curious illustration of the desire felt among the humbler classes in the provinces to see the Exhibition, that a poor fishwoman, from the parish of Paul, in Cornwall, named Mary Calinack, aged 84, walked to London, a distance of 350 miles, for the purpose, occupying in the performance of this pedestrian feat no less than five weeks.

Preservation of the Building.—A scheme for preserving the Building is said to be about to be propounded, in which its maintenance, independently of either Royal Commission or Government, is to be shown to be feasible. This, supposing the Woods and Forests are willing, will be a great point gained, since no public grant seems at all likely to be obtainable, and as to the surplus, that is a sealed source so far as the general question is concerned. As regards the appropriation of this surplus, the Mayor of Birmingham (Mr. Lucy), whose activity on behalf of the Exhibition is so well known and so highly appreciated, has brought before his fellow-townsmen a proposition in the form of a memorial to the Prince and the Royal Commission, and calls attention to the Conservatory of Arts and Manufactures and the Central School of Arts and Manufactures of Paris, as offering examples for similar institutions in this country, and proposing that there should be founded with the surplus proceeds of the Exhibition, as being strictly within the terms of the pledge given, "a Great Central College of Arts and Manufactures in London," as also "a Museum of Arts and Manufactures;" and that provincial schools having the same object in view (such as Schools of Design) should have connection with the Central College, and be carried on under the same system; and, in order that the public may be satisfied with the administration of these provincial establishments, and have a voice in the general system of education, which is of such importance to our commercial prosperity, it is suggested, "that when such provincial schools may be founded in boroughs, the Mayors should be *ex officio* members of the General Board of Metropolitan Direction." This memorial has been received in Birmingham with great unanimity, and a hearty approval given to its suggestions, and it is now in the course of signature. Here, then, we have a definite proposition at last, whereon to open the question, "What is to be done with the surplus proceeds of the Great Exhibition?"

The question as to the removal of the mass of goods now in the building is beginning to attract attention. The packing up of great numbers of the articles will be found to be a delicate task, and one which will not be easily got through.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.



No. 2. October 11, 1851.

THE CRYSTAL FOUNTAIN IN THE TRANSEPT LOOKING NORTH.

MINES AND METALLURGY.

IRON ORES AND MANUFACTURE.

IRON, *its uses and properties.*—Of all substances in nature that are available for the purposes of man, and have assisted in advancing him to that high position in which he is enabled to command and guide mechanical force to an extent almost unlimited, there is not one that can be regarded as more important than iron. Without this metal the stores of mineral fuel must have remained unemployed, or at least must have been of comparatively little value: without it, the other metals, however valuable and useful, could hardly have been obtained for use; without it, the earth itself could hardly be made to yield, at least in cold and temperate climates, those abundant returns of food which support millions of human beings in health and comfort: and without it there could have been no such systems of communication between distant lands connected only by the ocean, as are now found to be true sources of commercial wealth, and of the advantages of which we Englishmen have the best knowledge of any people in the world. Gold and silver without iron are mere toys for children and savages; precious stones without iron remain encrusted with the matrix, which prevents their beauty from being seen; various earths and metals now of enormous value would be unknown and unattainable without the iron implements by which they are produced; and steam, that source of all power, that giant by whose services the most impossible things are effected, would sleep at rest, or, if employed, would be occupied in the merest trifles, if it were not that its forces are concentrated, and its powers directed by the iron prison by which it is confined, and the arms by which it works. Look where we will, in the vast forest of human constructions, exposed within the walls of the Crystal Palace, we shall every where see contrivances in which iron holds a prominent part, from the pillars and girders that support the Building itself, to the nail and the pin that connect the different parts of the smallest object exhibited within it. We propose, therefore, to consider the various sources from which iron is obtained, the mode of obtaining the metal, the methods adopted for preparing it for uses of various kinds, and the applications commonly made.

Perhaps it may be well, however, first of all to mention the chief properties that give a value to this metal. The first of these is its hardness, which is always considerable, but may be varied by different modes of treatment, and in one state (that of steel) may become so great as to cut all but the very hardest substances in nature. Owing to its hardness, iron is well adapted for making all kinds of tools and implements, and the use of it is now so extensive in this respect that hardly any limit can be put to its employment. Next to hardness, iron is remarkable for its tenacity, in which, when pure, no metal surpasses it. A wire, 1-12th of an inch in diameter, will support a weight of a quarter of a ton without breaking. It is needless to enlarge on the advantages of such a property, and the application of iron wire in the manufacture of ropes and chains are examples of this power of tenacity, which will occur to every one.

The next remarkable property of iron is its malleability, which is greatest at a high temperature, and in consequence of which it may be hammered into almost any shape, and rendered available for innumerable important uses. Every one is aware of the facility with which the blacksmith at his forge will mould a piece of red-hot iron into the required form; and those who have visited any large manufactory in which iron is worked will know of yet further operations of a far more astonishing kind.

On the further application of heat, iron exhibits other properties equally remarkable and useful. It can be fused when nearly pure, but requires for that purpose the very highest degree of heat producible by a strong blast. Although thus difficult of fusion, however, there is no difficulty in uniting two pieces at a far lower temperature, for this metal is capable of "welding," a term given to the processes of uniting two surfaces by a kind of cementation, obtained when both surfaces are at a high heat and very clean, and are then hammered together. Few metals, and no other substances known, exhibit this property, but its value is too manifest to need further remark.

Its Manufacture.—Although iron in its pure state is tough, almost infusible, malleable, and admirably adapted for various purposes in which great strength and tenacity are needed, there are yet other uses in which a more fluid condition is desirable, and others again where a far greater degree of hardness is wanted. Both these are obtainable, however, by a very slight admixture of a substance so common as charcoal (carbon), which in different proportions renders the iron either so easily fused as to be readily cast into moulds, or so intensely hard as to form steel. In the ordinary method of reducing the metal from the ore, a number of impurities remain, the proportion of iron not exceeding from 91 to 95 per cent., although of the remainder not more than from three to four per cent. are carbon, except in very unusual cases. This small percentage suffices, however, to alter the character of the product so far as to give a peculiar granular texture, sometimes almost crystalline. The metal is also then more brittle, lighter, and more fusible than malleable iron. At a red heat, when the iron is made with charcoal, cast iron is so soft that it may be cut with a saw, and in this state by admixture with a small quantity of other substances, it may be rendered far more fusible.

When iron, cast into pigs with the impurities already alluded to, is subsequently melted and exposed for some time, in a fluid state, to the air, it parts with the greater portion of such foreign substances, becoming at length less fluid and much more pure. When in this state, if it is removed from the furnace, exposed first to the violent blows of a heavy hammer, and afterwards passed through heavy rollers, it is brought into the state of wrought or bar iron. The purest kinds of wrought iron still contain a certain portion of carbon (not exceeding five parts in a thousand, and often not exceeding two,) but in this state the metal is tough, solid, better adapted than cast iron where durability and strength are needed, and having a very distinct texture. Soft bar iron is more free from carbon than hard, but no additional hardness is produced by rapid cooling after exposure to a high heat, as is the case both with cast iron and steel.

When pig iron, containing little besides carbon, and, perhaps, manganese, is first refined by exposure to the blast under charcoal, and then made into flat bars, and these bars cut into lengths and welded together into bundles, they become what is called *shear steel.* This, again, when exposed for a period of from five to eight days, at a red heat, in pots filled with charcoal powder, becomes altered by the absorption of carbon, which penetrates the iron, and when it meets with any oxidised portions produces blisters forming thus *blistered steel.* This fused under pounded glass, with or without carbon, and then cast into ingots, becomes *cast steel.* In this last state, it is fit for use in the arts, and is somewhat whiter than iron, and has a distinct fracture; when made red hot and slowly cooled, it becomes soft, but when re-heated and suddenly cooled, it may be brought to almost any degree of hardness, being then also very elastic, more or less brittle according to circumstances, and capable of use for a variety of important purposes. The nature of the resulting steel is almost entirely affected by the temperature to which it is raised before cooling, and by the mode of cooling; and as the temperature is marked by the colour which the metal assumes while re-heating, this is commonly referred to as an indication of the temper. The order of colours is, straw yellow, deep yellow, purple, violet, dark blue, and light blue.

Iron Ores—Sources of.—The sources from which iron is obtained vary much in different countries; but the common ores are oxides and carbonates, of which there are several varieties. The richest is the magnetic iron ore, containing upwards of $71\frac{3}{4}$ per cent. iron, and either itself magnetic or readily attracted by the magnet. It is of iron-black colour, brittle, and often crystalline. Little of this ore is found in England, but large quantities occur in Scandinavia, Russia, and India, which are all celebrated for the quality of the steel manufacted from their iron; and it is abundant, also, in North America, Mexico, and Brazil. The ores of this kind are reduced generally with charcoal, and on rather a small scale, and are easily brought into the state of pig, having few earthy impurities mixed with them. All the finest steel is made from magnetic ores; and fine samples of the ores themselves, and the pig and bar iron manufactured from them, are exhibited in the Russian and Scandinavian divisions. From India, also, besides a large series of ores, there is exhibited a case containing the various conditions of the iron, including the steel in various states known as *wootz steel,* and exhibited by the Indian Iron and Steel Company. The large and highly-important series of Sheffield goods on the British side must also be mentioned here as presenting the best and most valuable illustration of the products obtained from the magnetic ores. Amongst the Sheffield goods are also one or two models—one in particular, of large size and in great detail, illustrating the whole of the processes adopted in converting iron into steel, and bring this very remarkable compound of iron and carbon into a state available for the manufacturer. We refer to the model of the Cyclops Works in Class 22, No. 109 A, which is accompanied by a series of articles in steel of great interest. No one can have examined the articles exhibited in the Sheffield court without being perfectly satisfied of the high state of perfection which the manufacture of steel has attained in this country, and the importance of having the best material for such admirable workmanship. There is generally understood to be a greater amount of elasticity, and a susceptibility of finer temper in the steel made from Indian iron than that from Sweden; and it has been supposed by very eminent chemists that this owing to the presence of a small quantity of aluminum; but it must as yet be considered doubtful whether this is essential or accidental.

Before concluding the notice of the magnetic ores, we should direct attention to those obtained in British North America, amongst which are some fine specimens indicating a source of wealth which will not, we are sure, be neglected.

Next to the magnetic ores, the richest material from which iron can be obtained consists of the peroxide known to mineralogists as the specular iron ore, micaceous iron ore, red hæmatite, and oligist respectively. This ore is also sometimes called iron-glance. It exists in two forms—the one earthy, and the other crystalline and metalliferous; but both are equally rich, and yield, when pure, about $69\frac{1}{3}$ per cent. of metallic iron. These ores, like the former, are not those generally found and used in our own country, although they exist there in considerable abundance, and are

even used extensively to mix with and bring to a convenient average some of the poorer ores. The more brilliant and metal-like specimens chiefly abound in Elba, and are often called Elba ores; but these and other less glittering forms also occur in almost every district where iron is found in mineral veins. They are worked in small furnaces almost as easily as the magnetic kinds, but are nowhere so valuable for the manufacture of steel, although, like the former, they are smelted with charcoal only. The Belgian ores, and those from Spain, may be quoted as examples of these, and the admirable quality of the iron exhibited, and of the goods manufactured of such iron, shows clearly that if it cannot vie with that made in England in the matter of cost, it may yet take a very high place for toughness and durability. It is chiefly the earthy varieties (hæmatites) that are used in England, and of these many specimens, very remarkable for size and beauty, both from Cornwall and Lancashire, have been exhibited by various persons, and amongst the rest by Mr. Thomas Ainsworth, of Cleator near Whitehaven, and Messrs. Harrison, Ainslie, and Co. of Newland Furnace, Ulverston. In both these cases the ores contain from 60 to 65 per cent. of iron, and are found immediately adjacent to the poorer ores common in England, and also to the coal, so that they are brought into immediate use. The quantity that can be supplied is very large; but there are at present, we believe, only three furnaces in blast. The iron is considered to be of very good quality.

In some parts of the world large quantities of hydrous oxide of iron are obtained in a state very well adapted for the manufacture of iron. Such, for example, as the bog iron ores, of which there are magnificent specimens from Canada, said to produce excellent metal. In its pure state, this hydrous oxide would not yield more than 56 per cent. of iron, and from 12 to 18 per cent. water; but it is rarely found in large quantities having anything like this value. The technical name for the ore in question, as a group, is *brown hæmatite*, and they may be regarded as averaging 20 to 40 per cent. of iron. Large quantities occur in the northernmost counties of England, in distinct and regular beds, associated with the lead veins of that district.

Clay-Iron Stones.—But the ores of chief importance to England, and those supplying by far the largest proportion of all the iron manufactured in the world, are neither the richest in quality, nor those deposited in the thickest masses, but another series, far less likely, at the first glance, to attract attention, and requiring methods to reduce them of a more complicated kind than the simple forges hitherto needed. We allude to the *clay iron-stones*, as they are called, which are widely distributed with the coal, and near the limestone, in South Wales, North Wales, Shropshire, Staffordshire, Yorkshire, Derbyshire, and Northumberland, and the valley of the Clyde. These are the true materials of England's greatness, and these, accordingly, have long been anxiously sought after, and most carefully worked. From these sources upwards of two millions and a quarter of tons of iron are annually produced: of which South Wales furnishes 700,000 tons, South Staffordshire (including part of Worcestershire) 600,000, and Scotland 600,000 tons. Of the ores from these several districts, there is one large and most valuable series of about 500 specimens, very carefully selected and exhibited by Mr. S. Blackwell, of Dudley—a gentleman who deserves the utmost credit for having, at great expense of time and labour, brought together these materials, and arranged them as a noble illustration of what nature has done for the British Islands in reference to iron.

All the clay iron-stones partake of a general character, although they differ a little in appearance, and much in relative value. They are nodules, consisting of an impure carbonate and oxide of iron, mixed with clay, and apparently separated from a more generally diffused ferruginous condition, in a large series of deposited rocks, including much clay and much vegetable matter. They occur in bands generally of no great thickness (often only a few inches), and not far from thicker bands of coal, with which they are worked. The quality of the iron made from them varies a good deal—partly, it may be, from the condition of the ores, but chiefly from the fuel with which the ores are smelted and refined.

The manufacture of iron from these poor ores is conducted on a very large scale, in furnaces constructed at great cost, and kept constantly at work for a long time. Described in their simplest form, these furnaces consist of a receptacle at the bottom for the fused iron to collect in, and from which it can be drawn off from time to time; a chamber to receive and fuse the mixture of ore-flux and fuel put in from the top, and a blast to produce intense heat. The chamber is generally high, and partly chimney-shaped; the blast is conducted by pipes from a machine where it is produced, and there are means of drawing off not only the metal, but the slag or scum that forms on the top of the fusing mass. The furnace being already heated, a due mixture of material, consisting of the ore (consisting of carbonate and oxide of iron, with alumina and silica), limestone, and coal or coke, are thrown in from the top; the alumina and silica of the ore then combine with the lime, forming a kind of glass under the influence of the burning fuel, acted on by a powerful blast, sometimes of hot air, and the iron is set free, and sinks in a fluid state to the bottom. The floating slag may be drawn off from time to time, and the charge of ore flux and fuel repeated till a sufficient quantity of metal is collected. The charge is added, and the metal drawn off generally at regular intervals, and the result is the production of pig iron. The further processes have been already alluded to.

Very fine specimens of pig iron and bar iron are exhibited both in Class 1 and Class 22. Among the latter, the Low-moor Works, near Bradford, Yorkshire (Messrs. Hind, Dawson, and Hardy), present a series extremely remarkable for their variety and great excellence, some specimens of rivet iron, knotted cold with two or three knots, and bent at one end, showing very strikingly the tenacity of iron in a wrought state. This is shown still further by a piece of chain iron, originally 4 feet 5 inches long and 1¼ inch diameter, strained and broken by a weight of 31 tons, but which, before being broken, was drawn out as much as 10½ inches, and was reduced to a diameter of ¾ inch. Other fine examples of good bar iron, adapted to various purposes are exhibited by the Ebbw Vale Company, South Wales (Class 1, No. 412), and by Messrs. Bird and Co. (No. 411), who show admirable specimens of Staffordshire iron. The product of the Scotch iron and coal fields are presented by the Monkland Iron and Steel Company (426); and, before leaving this part of the subject, we must mention Mr. Stirling's patented method of mixing together malleable and cast iron, and also of mixing other metals (chiefly zinc) with iron to produce greater strength in the compound. Ireland, also, has not been unrepresented. The specimens exhibited from Arigna by Dr. Moore (No. 40[illegible]), are interesting, as made from charred peat. The quality appears good, but the economy of the operation is still doubtful. The ores are rich, yielding as much as 40 per cent. of iron. Coal exists in the neighbourhood, but it is not of excellent kind, and the cost of the ton of iron manufactured in this locality must be reckoned as not much under 4*l.*, a price far too high to promise much success at present.

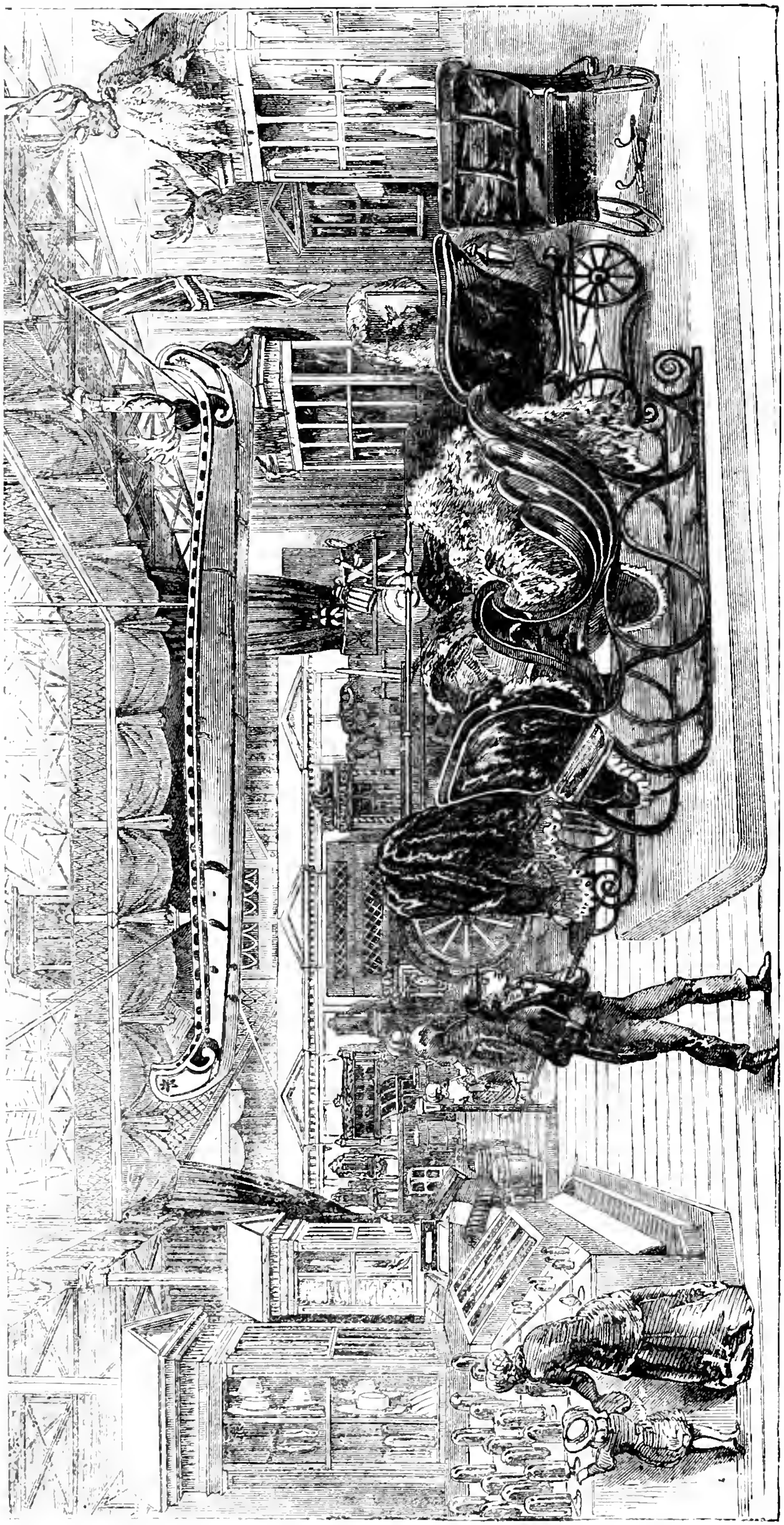
The manufacture of iron on a large scale has been already described in speaking of the management of the abundant British ores.

There are many differences of detail in the methods employed on the Continent, and even in particular districts in our own country, but the above general account will enable the reader to understand something of the labour and difficulty, as well as cost, required to produce a material which is, however, as we all know, supplied at a price which brings it within the daily use of every person for the very commonest purposes.

It may give an idea of the magnitude of the work to mention that there are now 185 blast furnaces for the manufacture of iron in South Wales, 143 of them being actually at work, and producing, on an average, 100 tons of iron per week; that in Shropshire, and its neighbourhood, there are 38; in Staffordshire, 108; and in the more northern counties, 46—such furnaces making in all 192 in blast, in addition to the 143 in Wales. Scotland adds its share to the list, and the general result is, that the enormous quantity of 2,250,000 tons of iron are now annually manufactured in the British islands, being at the rate of two cwt. a-year for every man, woman, and child of the whole population. As no less than three tons of coal are required to produce each ton of iron, this manufacture also requires a consumption of 7,500,000 tons of fuel, without including that employed in the further operations of iron-making, and the incidental uses of coal in various ways.

THE CRYSTAL FOUNTAIN. (SEE FRONT PAGE.)

HAD this Exhibition taken place seven years ago, the examples of glass manufacture on the British side would have been so ridiculous as to have provoked contempt. Happily, the removal of that fiscal restriction which paralysed our glass trade for so many generations, preventing, as it did, all improvement, and creating a monopoly where freedom alone could be expected to be successful, has enabled us to make such strides in this important manufacture as to place us in a position to become, at least, equal to our continental neighbours in the production of ornamental glass, whilst it is confessed that we are already superior to them in the manufacture of the more useful kinds. The Crystal Palace itself is an example of this; and Osler's Glass Fountain is fitly placed in the centre at the intersection of the nave with the transept. The basin of concrete in which the fountain itself is placed is some 24 feet in diameter, and affords a goodly surface for the falling spray. The structure of glass stands 27 feet high, and is formed of columns of glass raised in tiers, the main tier supporting a basin from which jets of water can be made to project, in addition to the main jet at the top. As the structure rises it tapers upward in good proportion, the whole being firm and compact in appearance, and presenting almost a solidity of aspect unusual with glass structures. A central shaft with a slightly "lipped" orifice finishes the whole, and from this the water issues in a broad well-spread jet, forming in its descent a lily-like flower before separating into a spray, which in the sun-light glitters and sparkles in harmony with the fountain itself. Altogether this is an unique and magnificent work, and many difficulties of construction have been overcome before the structure presented itself in its present form. The principal shaft is strengthened by means of a rod of iron passing through it, but concealed from observation by the refracting properties of the fans. Upwards of four tons of crystal glass was used in the construction of this fountain. The principal dish is upwards of 8 feet in diameter, and weighed previous to cutting nearly a ton. The shafts round the base weighed nearly 50 lbs. each previous to cutting.



THE CANADIAN COURT.

FOREIGN AND COLONIAL DEPARTMENTS. No. 2.

THE CANADIAN COURT.

A HUNDRED years ago, supposing a great international and industrial exhibition to have been possible at that time, Canada would have furnished a very different assortment from that with which she has presented us. Then we should have had a rude and miscellaneous lot of native manufactures and native finery, something after the fashion of that actually collected in the Tunis bay (which we shall describo hereafter)—a wigwam, some wooden or horn spoons, rough earthen pots, a few embroidered mocassins, a few tomahawks, and a dozen or so of scalps and other military trophies; but nothing indicative of the natural resources of this vast and almost virgin tract of territory, nothing that spoko of the honest industry or intelligent enterprise of its inhabitants. Very different from this, however, is now the case. Civilisation has begun its useful work in the far west; European industry has planted the spade there, and some of the fruits are now before us—speaking much and creditably for the past, but speaking still more cheeringly of what is yet to come.

We have not yet had possession of Canada for a hundred years. It is set down amongst the discoveries of Sebastian Cabot in 1497. The French, it is asserted, made a map of a portion of the coast in 1508; in 1525, the country was formally taken possession of in the name of the King of France; in 1535, Carlier explored its great river, and named it the St. Lawrence, from having on that saint's day first sailed upon its waters. The first settlement was at Quebec in 1608, and the country remained in possession of the French until the capture of that city by General Wolf, in 1759; and by the treaty of Paris, in 1763, the whole territory, comprising an area of about three times as large as Great Britain and Ireland, was ceded to England.

In Canada emigration has been going on thither ever since, but still there are vast regions of the best land still uncultivated and covered with forests. In 1844 the occupied land in the East or Lower Canada amounted to 7,540,450 acres, of which 3,083,950 are cultivated, and 4,456,400 still unreclaimed. The great plain between Lakes Huron, Erie, and Ontario, comprising about 20,000 square miles, and the best grain country of any in the northern parts of America, is still for the most part covered with lofty forests.

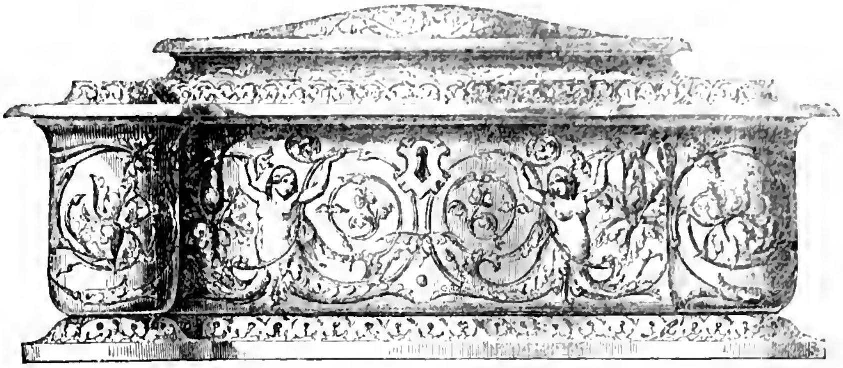
The Canadian contributions at the Great Exhibition are not so showy certainly as those from the East Indies, sent in by the East India Company, and which happen to be located in the adjoining and opposite compartments, but they are more valuable as evidences of social wealth and social advancement. They are the spoils of peace, not of war, the industrial beginnings of a junior branch of the great civilising family of the universe, not the gaudy remains of an effete barbarism, which has been demolished, but not yet replaced by anything better. The Canadians send us abundant samples of natural wealth drawn from the bowels of the earth—specimens of iron, copper, and silver ore, besides a case of native gold obtained from the gravel on the south-east side of the prolongation of the

(*Continued on page 22.*)

PAPIER MACHÉ JEWEL CASE.

BY JENNINGS AND CO.

The manufacture of Papier Maché has been brought to a high state of perfection by Messrs. Jennings and Bettridge, of Birmingham, who exhibit its application to a great variety of articles of use and luxury. The jewel casket before us, which is from the design of Mr. W. R. Fitzcooke, is a favourable specimen; elegant in shape, and the ornaments graceful in character, and suitable to the occasion.



PAPIER MACHE JEWEL-CASE. JENNINGS AND BETTRIDGE.

There are two sorts of Papier Maché: one in which the paper is beat up into a pulp, and then moulded to the form required; the other in which successive layers of paper, wetted, are placed under a strong pressure, which slightly alters the form. The latter is the method adopted in the case of tea-trays and other works of flat surfaces and simple structure; the former is used in the case of more intricate objects, as articles of furniture, &c.

SILVER SALT-CELLARS

ORNAMENTAL SILVER.

The articles in decorative plate, both of British and Foreign manufacture, displayed in the Great Exhibition, will come in for a large share of our attention. There are many principles involved in their production, both as regards taste of design and the skill and finish of its working out, which are highly interesting in connection with the history and prospects of Art. These are points which we shall enter more fully upon in the course of our observations on "the Arts of Design and Decoration." In our occasional notices of particular objects, we shall only incidentally refer to such points of criticism as appear to be illustrated in a striking manner by them. The *Silver Centre Piece*, by J. Angell, represents Sir Roger de Coverley having his fortune told by gipsies, Addison standing behind, reclining against a tree. The group is very satisfactorily composed, and the workmanship is of an excellent order; but we object, as a rule, to all story-subjects in ornamental plate, and particularly to story-subjects which are purely inventional; and, to say the truth, neither very striking in their incidents, nor of very great notoriety. Allegorical and conventional subjects are all very well, if including appropriate objects of decoration; but an old gentleman having his fortune told, and another looking on, is but a dull episode for the dessert table.

BY MOREL.

The *Silver Salt-Cellars*, by Morel, are very beautiful little affairs, in the Louis Quatorze style. They represent rustic children, quite of the Watteau order, bearing baskets, and dancing lightly under their burthens. Each of these figures have been individually modelled, and finished with great care in the *répoussé* method, a style which has been abandoned ever since the sixteenth century, until its recent revival by enterprising artists of our own day.

In the *répoussé* method every feature and lineament is the result of the inspiration and accurate handling of the artist at the moment of execution: and exact repetitions are impossible. This is conducive to the culture of art; though of course contrary to the economic principles of mere manufacture. In articles of *virtù*, however, art should be considered as supreme, just as in manufactures economy is everything.

CENTRE PIECE, SIR ROGER DE COVERLEY, BY J. ANGELL

Green Mountains: specimens of magnesite rock, of stones of fine quality for the purpose of lithography, of agates, soap-stones, gypsum, slates, and serpentines. Of timber there is a large assortment, the major part forming a large pile or trophy in the midst of the main avenue, and which we shall speak of in detail presently. Of agricultural products we have numerous samples, the Canadian exhibitors evidently attaching a due importance to this branch of their national wealth: barrels filled with corn, Indian meal, barley, oats, peas, beans, flax, potatoes preserved for sea voyage; with Siberian oil-seed, hemp, hops, and sugar from the maple tree, all show the varied richness of a land which, put to good account, might effectually relieve the distress of the older communities of the world.

Lastly, in unmanufactured, or but partially manufactured, products, there are specimens of moose hide and leather, moose-deer's head and horns, calf-skin, porpoise-skin, &c.

In addition to these resources of natural wealth, the Canadian colonists are favourably represented as regards their skill of handicraft—particularly as relates to furniture and articles of domestic and general use. Of furniture there are several most creditable specimens—substantial in make, whilst aiming at some trick of style in decoration, which, although of course not claiming to compete with the more finished and artistic articles of *luxe* produced in London, Vienna, and Paris, show an aptness of handling, which a little study of improved models, abundant opportunities for which the present Exhibition affords, will doubtless, in future, direct more happily. Amongst the articles of furniture deserving of especial mention, from the loyal associations connected with them, are half-a-dozen chairs, the seats and back worked in worsted and silk by the ladies of Montreal, "for England's Queen." There are also a handsome pianoforte and some other musical instruments, showing that Saxon industry in Canada does not intend to restrict itself for the future to mere articles of utility.

In the midst of the room are some very stylish sleighs, with harness and sleigh-robes complete; and a fire-engine of unusually large proportions, and remarkably elegant design and workmanship, capable of throwing two streams of water 156 feet high, or a single stream 210 feet high. There is attached to it a box containing necessary tools, and with a seat for the accommodation of the firemen, but this adds greatly to the length, and although a useful contrivance for the comparatively open thoroughfares of Montreal, would hardly do for the crowded London streets.

Amongst other matters which the visitor will remark in this collection, are some interesting models, including one of a wooden bridge, having an arch of 250 feet span; a Canadian trading canoe, made of course of bark—a remarkably fine specimen of this class of boat; ship-building crooks and futtocks; specimens of cordage; various tools and articles of cutlery; samples of carpeting, blankets, and grey cloth; fine cloths and satinettes; patent leather trunks, bound with brass ribs, and remarkably substantial; cooking and parlour stoves; a church bell, made from the copper of Lake Huron; some excellent printing types; a new description of copying-press; snow-shoes and mocassins; and even some articles of jewellery and some specimens of artificial teeth.

We shall give a view of the Canadian "Trophy of Timber," with some observations on the Timber trade, in our next.

INAUGURATION OF THE CRYSTAL PALACE.

The large illustration across pages 24 and 25 represents the entrance of her Majesty and the Prince Consort, accompanied by the Prince of Wales and the Princess Royal, and their attendants, for the Inauguration of the Great Exhibition on the 1st of May. Few who were present can forget that scene. After her Majesty had left the robing-room a flourish of trumpets announced her approach, when the bronzed gates leading into the transept were flung open, and the full crash of chorus, band, and organ burst into "God save the Queen," only to be drowned by the acclamations which simultaneously arose from floor and galleries, from nave and aisles, as the Royal procession advanced to the splendid dais prepared for them. Following the Lord Chamberlain, and a group of the principal officers of the household, all of them walking backwards, and ushering in her Majesty, came the Queen, leaning upon the arm of Prince Albert, and holding the Prince of Wales by the hand: the Prince Consort conducting, in like manner, the Princess Royal. Following the Royal group was a glittering line of lords and ladies—the uniforms and Court dresses of the gentlemen contrasting with the toilettes of the maids of honour and ladies in waiting. Close to her Majesty walked the Prince of Prussia, with the Duchess of Kent on his arm; then followed a long line of officers of the Court, &c.

Model of the Falls of Niagara.—Among the various models to be found in several parts of the Great Exhibition, is one of the Falls of Niagara, which has deservedly attracted a large share of attention. This model has been transferred by Mr. Catlin from his collection of American-Indian productions, and faithfully represents the "Horse-shoe" and American Falls (the former descending 150 feet, and the latter 163 feet), the various mills, hotels, residences, roads, and Goat Island, extending to 75 acres, embraces an extent of country equal to nearly a square mile; and being constructed to a scale of 99 *feet to an inch*, every object is very distinctly shown. The amount of water descending over the two falls is said to be equal to 1,715,000 tons per minute, and which is chiefly derived from the drainage of Lake Superior, Lake of the Woods, Lake Michigan, Lake Huron, Lake St. Clair, and Lake Erie.

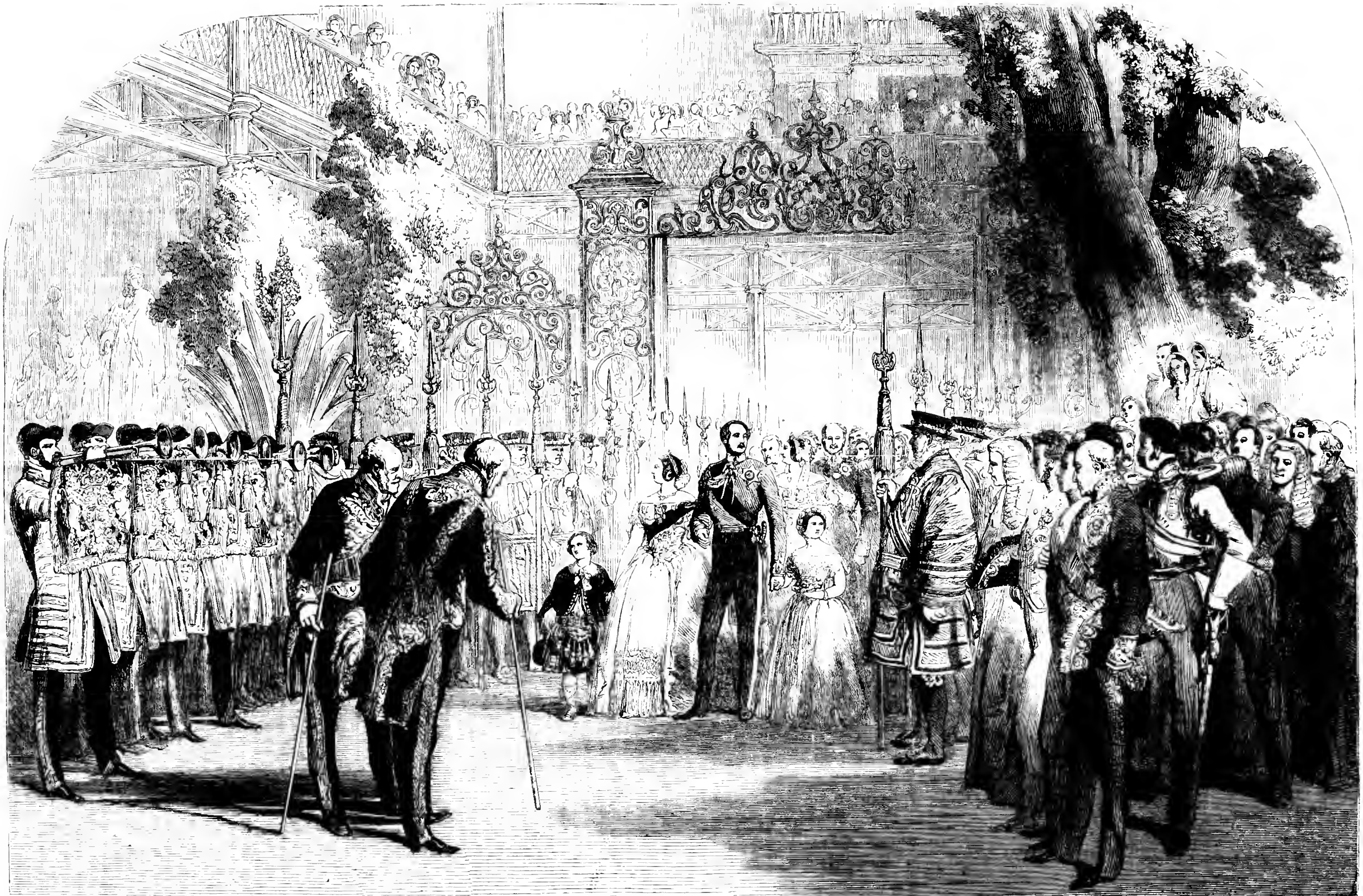
ARTS OF DESIGN AND DECORATION.

PRESENT STATE AND PROSPECTS OF DECORATIVE ART.

THE ornamentation of works of utility is a subject which, after very long and almost total neglect, is beginning to engage the attention as well of producers as of those who employ them, and which it may be interesting to consider in reference to the examples presented in the Great National Exposition. The subject is a very wide and a very inviting one: we shall endeavour, however, to restrict our observations within the limits of the practical bearings of it. Yet, in doing so, we must not omit to point out what we conceive to be the legitimate province over which such an inquiry might extend, as it involves a necessary relationship, in an æsthetic point of view, of several branches of art hitherto having little connexion with one another, but which, nevertheless, have strictly common interests, in this at least—that for success they must conform themselves to the prevailing taste or prejudices of the age. The rule is imperative—there is no escape from it; and though fine art may pretend to turn its back upon useful art it is difficult to say where the province of the one begins and that of the other ends; whilst it is positively certain that where fine art has "no connexion" with useful art, like other fine people amongst a non-productive community, its resources become sapped, and it dwindles to decay. What is architecture but building upon principles of taste in which the eye is consulted? the same "taste" which prescribes the form of a hat and the fashion of a sleeve? The chain which connects all the handicrafts employed in the various intermediate matters of social requirement may be a long one, at some points a slight one, but still it is an unbroken one, and will make itself felt sooner or later. As between architecture and internal decoration and furniture the links are very palpable in the recent adoption of mediæval models; where the wood carver and the upholsterer very quickly followed upon the heels of the builder, and where the artificers in silver, and brass, and potter's clay, and now the book-printer and bookbinder (to say nothing of the writer of books) and the embroiderer of silks and woollens, and the whole host of those who minister to the need and fancy of others, are with very great precision following upon the footsteps of one another, or, rather, walking hand in hand over the same path. How long it may be before the tailor and hatter join in the march, and turn us out into *ye street off Bondee*, "a fine old English gentleman" after the fashion of his forefathers in the thirteenth century, we do not pretend to guess.

There should be a nice and critical scrutiny of the principles of art evinced in every class of works from the highest to the lowest, if we would hope to educate or guide the public taste in these matters. There is no doing things by halves, and fortunately so, as we think; for the same course of culture which brings the judgment to correct appreciation of excellence and beauty in the structure of a palace, will apply equally to the fashion of a dress, and the ornamentation of the material of which it is composed. The same principles of harmony, the same rules of propriety, the same submission to the dictates of common sense and common fitness which regulate the one, regulate the other also. And surely not without justice, surely not ignobly, is art, high art, employed, if, whilst it builds and decorates temples for man's resort, it decorates man also—if, whilst it paints the portraits of our wives and daughters in the most becoming costume, it gives some hint how we may have the originals as advantageously "treated" in that respect when at home.

This brings us at once to a consideration of what has been done towards this art-culture—what has been done towards the accomplishment of this only profitable "Art-Union"—we mean the association of decorative art with art purely useful. We should observe that (speaking of modern times) it is only very recently that the idea of such an association entered into the minds of men: fine art always before that sticking to its picture-frame; useful art to the stocking-frame and the loom. And now that they have consented, as it were, to a conference, with a view to establishing a commercial league, it is not without considerable misgivings, and reserve, and jealousy, resulting from an imperfect understanding of their relative right positions and their common interests, that they go on, or stand still over the matter. The great difficulty at present, as it appears to us, required to be settled, is, where art ends, and where handicraft begins—the middle ground upon which head and hand work together. In a cabinet picture for the annual exhibition, and in the manufacture of a coarse calico, there is no room for doubt upon this point; it is where the picture and the calico require to be combined. So, in the building of your house, the R.A. is your man to superintend, and take his percentage of commission; but when it comes to the carpeting and furnishing, upon which, as much as upon the actual disposition of the stone-work, the comforts and "effect" of your new mansion depend, he leaves you to the upholsterer and the carpet manufacturer. He will not take commission out of wood-work and woollens. Yet it was not always so—it is not so to the full extent now abroad; and when we all know our own interests better, it will not be so with us. The advantages of a co-operative association of art and handicraft will neither be one-sided nor short-lived. Art will educate and reclaim a



OPENING OF THE GREAT EXHIBITION, MAY 1, 1851.—ENTRANCE OF HER MAJESTY, PRINCE ALBERT, AND THE ROYAL FAMILY.

LITERATURE OF THE EXHIBITION.

THE EXHIBITION of 1851, &c. By CHARLES BABBAGE, Esq., 8vo. Pp. 231. Murray.

THIS work is illustrative of the unparalleled Exhibition, and its unparalleled Crystal Palace repository, and treats not only the immediate subject comprehensively and scientifically, but also discusses, in no forbearing temper, the conduct of Government and the evils of party in other respects. The fame of Mr Babbage, as a mathematician, is too well known to need "exposition" (as he prefers to use that French word instead of the usual English "Exhibition"); and his unfortunate differences with the Government concerning his calculating machines, and disputes with several of his contemporaries in the pursuit of science, are also familiar to the scientific public, and we shall, therefore, in reviewing his book, not follow him in any references to those subjects, which though mostly topics of much public interest, may be dismissed with bare enumeration in a notice which we would rather confine to the direct illustration of the actual Exhibition and its prospective results.

The philosophical mind and great intelligence of the writer are displayed, for our purpose, much more satisfactorily in his views of the principles of interchange, and of the rules by which judges and jurors ought to be guided, and his statistical facts and reasoning upon them, and their presence or absence in as far as the conduct of the Exhibition has been carried, and its future management and effects, are implicated. The grand principle enunciated upon the inquiry into the interchange of commodities, that the errors which have heretofore beset that difficult question, is, that *the free and unlimited exchange of commodities between nations contributes to the advantage and the wealth of all*: that this benefit arises from no sacrifice of one nation for the profit of another; and that the germ of the productive powers of man is by these means, without any increased labour, largely augmented throughout the world; that this increment is won partly by the suppression of ignorance and fraud, and partly by the united effects of industry, of skill, and of science, in compelling Nature to administer to the wants of man.

The tendency of the World's Fair to extend and cultivate these principles and relations is, consequently, highly applauded by Mr. Babbage, but he disapproves of some of the measures adopted for establishing them, and especially the rejection by the Commissioners of the proposal to mark the prices of the articles exhibited, which he considers to be the leading fault in the whole scheme. Upon this most practical point he observes:—

"This consequence of the absence of price is injurious both to art and to artists: it occasionally removes from the field of competition the best judges of real merit. It is true that in several professions a certain delicacy respecting money matters exists which is wanting in others. Medical men and artists are peculiarly subject to its influence; but it is not reported of any lawyer that he ever refused a fee: and it is recorded of some Secretary of the Admiralty, that he claimed *a quarter of a year's war salary*, on account of two days' interruption of peace by the combat of Algiers.

"§ Another result of prices not being marked upon objects is, that the public are unable to form any just estimate of their commercial value; consequently, no proper public opinion arises to assist the juries in their decisions. This is a matter of considerable importance: the duty of a juror at an exposition is quite different from that of a juror in a legal question. It is the business of the industrial juror to avail himself of the knowledge and the observations of all around him. Much of what he thus hears he may be able himself to verify by examination or experiment, and thus public opinion will be more matured, and the decisions of the juries have greater weight.

"§ Many of the qualities of the articles exhibited can only be ascertained by use, or even by their destruction. In such cases a single sample would often be purchased if it had its price affixed to it.

"Another class, small indeed in number, but important from its functions, suffers the greatest inconvenience from the absence of price. Those engaged in studying the commercial and economical relations of various manufactures, either for the gratification of their own tastes or for the instruction of the public, are entirely deprived of the most important element of their reasonings.

"If *every article* had its price affixed, many relations would strike the eye of an experienced observer which might lead him to further inquiries, and probably to the most interesting results. But it is quite impossible for him to write to any considerable portion of 15,000 expositors for their list of prices, or even to go round and ask for it in the building itself. Price in many cases offers at once a verification of the truth of other statements. Thus, to a person conversant with the subjects, the low *price* of an article might prove that it had been manufactured in some mode entirely different from that usually practised. This would lead to an examination of it, in order to discover the improved process. The *price* of an article compared with its weight might prove that the metal of which it is made *could not* be genuine. The *price* of a woven fabric, added to a knowledge of its breadth and substance, even without its weight, might in many cases effectually disprove the statement of its being entirely made of wool, or hair, or flax, or silk, as the case might be.

"The exchange of commodities between those to whom such exchanges may be desirable, being the great and ultimate object of the Exposition, every circumstance that can give publicity to the things exhibited should be most carefully attended to. The price in money is the *most important element* in every bargain; to omit it, is not less absurd than to represent a tragedy without its hero, or to paint a portrait without a nose.

"It commits a double error; for it withholds the only test by which the comparative value of things can be known, and it puts aside the greatest of all interests, that of the consumer, in order to favour a small and particular class—the middle-men.

"The composition of that commission must be most extraordinary, where an error so contrary to the principles and so fatal to the objects of the Exposition, could have been committed. It is not too late to apply at least a partial remedy to the evil, and it is scarcely credible that those with whom it rests can remain unconscious of the mistake into which they have been led."

The style and feelings of the author may be gathered from this extract, as well as his cosmopolitan manner of looking round upon the collaterals which are linked, however slightly, with his main argument, which, in this case, is to show, that, by their rules in this matter, the Commissioners "violate the very foundations of those principles on which the whole advantange of the Exposition rests."

Adjudication of prizes.—Leaving the topic, *i.e.* of the utility, yet largely practicable, of affixing prices and even of facilitating sales, which is also recommended, we quote some observations on the adjudication of the prizes, which are full of sound sense and instruction, and which, at the present moment, will be read with great interest—

"A clear statement of the principles on which each jury is to award prizes should be placed before them. These principles ought to be well discussed, and in that discussion manufacturers should be invited to take a part.

"The first object of the jury should be to lay down rules by which these principles are to be carried out. Each class of the subjects to be rewarded will have its own rules. They will generally be few in number, and capable of being expressed in few words; some of these are suggested below, but merely by way of example.

"One of the most general rules will indicate the means by which the jury can ascertain the fact, that the material of the manufacture under consideration is truly the substance it is represented to be. For instance, some woven fabric is examined, professing to be made entirely of wool or wholly of flax. It may be quite true that experienced manufacturers and dealers are able to detect any adulteration of either material by admixture with the other. But statements of facts made on authority, never possess the same weight with the public as those which are accompanied by information enabling any individual among the public to verify the fact for himself. The form of the fibre as shown by the microscope is one test. A more simple one is to burn some fibres in the flame of a candle. Every fibre which, when thus treated, produces the smell of burnt feathers, is animal matter of some kind, as wool, silk, horse hair, &c. The burnt fibres of hemp, flax, cotton, and other vegetable matters, have a totally different scent: a fact of which any one may readily assure himself by making the experiment. It may, perhaps, be necessary in some cases to wash the fabric under examination, lest, in what is termed the 'getting up for the market,' some animal matter or size might mislead. But the jury ought to be acquainted with all such difficulties, and they should state the method they took for investigating them.

"The microscope is of great use in detection of adulterations in most vegetable substances.

"Every object produced is subject to certain defects, and possessed of certain excellencies; these should be clearly enumerated. Whenever such statements are expressed by numbers, the information will be more satisfactory. Thus in cutting tools, as applied to various metals, it is very important that the angle at which the tool is applied should be stated: it is also necessary to state the angle which the edge of the tool receiving the shaving cut off makes with the surface cut. The velocity of the tool in cutting should be stated, also the names of the fluids, if any, used in cutting.

"The durability of woven fabrics, as well as of a great variety of other manufactured articles, is a most essential quality, on which, combined with the price, their chief value to the customer depends. It is very desirable that the jury should find satisfactory means of testing this most important character, which is not discernible even by the most curious and instructed spectator.

"The knowledge of the weight required for tearing asunder any woven fabric, as a ribbon, a staylace, tape, &c. together with the breaking weight of their individual threads, and the number of these threads in an inch, may in some cases be very valuable, especially in coarse articles, such as sail-cloth, sacking, &c. In other cases, the articles may be submitted to twenty or thirty washings and dryings, during which time it may repeatedly be examined. The greatest change will most frequently occur on the first washing, which removes the dressing.

"In many articles the durability of different parts varies considerably. In some cases one part will wear out, if replaced, many times before the remainder of the article is at all injured by use. In all such cases, the jury should adopt such rules as the following:—Examine the durability of each part, and also the difficulty and the expense of replacing it when injured. Examine, also, for the same purpose, what parts are most exposed to injury

larger field in the public mind; will, so to say, create a taste to which it will afterwards profitably minister;—handicraft will, by means of improved and novel designs thus placed at its disposal, be enabled to compete with the markets of the world, from a bold and independent ground, which it does not occupy at present;—finally, the artificers employed in this joint production will have constant opportunities of developing their inventive talents, and of advancing their position beyond that of mere live mechanism; and England, instead of being for ever a mere nation of shopkeepers, may become the art producer of the world, and the founder of a new school worthy of bearing its name.

For want of this application of inventive and original taste to handicraft, the latter, left unaided and in the dark, has had, through a series of generations, to resort to mere copying of favourite models of former periods—models more or less meritorious in themselves, but whose merit consisted mainly in their originality, and their general conformableness to the prevailing tastes, and the prevailing fashions in other matters, of the time in which they were produced. Thus have we constant boastings of pure *cinque cento*, pure *Renaissance*, pure Elizabethan, pure Louis Quatorze, and most abundantly of all pure *rococo*, as though these were passports to honour and favour, instead of simple confessions of bankruptcy in idea, and almost hopeless extinction of inventive faculty.

It is now fifteen years since not only the public, but the Government, began to awake to a full appreciation of the miserable state of darkness in which the country lay in respect to all that related to the ornamental part of manufacture—a circumstance which it was proved militated very seriously against the commercial prosperity which we are otherwise entitled to enjoy; and seeing the hopelessness of a spontaneous movement on the part of high art in aid of its humbler brother, it was resolved to establish Schools of Design, with a view to affording elementary instruction in the arts applicable to the decoration of manufactures, &c. The establishment of the Government School was quickly followed by that of others, some subsidiary, others independent, in various parts of the country. What the result of these efforts has been, may be gathered by those who take interest in the advancement of their kind, by inspecting the exhibitions of works of students which annually take place; for, as yet, we are sorry to say, there has been little direct effect upon actual manufactured productions.

In simple truth, the school of design system, considered in reference to what was expected from it and what has been done for it, has proved a failure. The cause of this failure has been much and angrily discussed by several parties who have been more or less mixed up or interested in the scheme; but, upon a calm revision of the whole case, we think it may be summed up in very few words: *first*, the schools of design have been too limited in the field over which their influence was proposed to extend, being restricted chiefly to the manufactures in which patterns are artificially multiplied, and not touching the higher branches of decorative production, such as architectural design, wood-carving, room-furnishing, &c., to which textile manufactures are but tributary; *secondly*, the instruction has for the most part been limited to mere copying, whether by drawing or modelling, of actual objects, whether natural or manufactured, no attempt having been made to inculcate the principles of design as design, much less to encourage the inventive powers and educate the tastes of the pupils; the consequence is, *thirdly*, that the latter, having been left to their own devices, with their mere acquired faculty of imitating actual objects, without any sound principles as to the selection and disposition of those objects for decorative purposes, having regard to their respective fitness as embellishments of various classes of productions to which decoration may be applied, have (with few and trivial exceptions) failed of producing anything which has proved worthy of practical adoption by our manufacturers; so that, whilst they themselves have but little advanced their stations and prospects by years of study, the manufacturing taste of the country is just where it was before the scheme was started.

We have too much reason to apprehend that this unpropitious state of things is in part attributable to the very men who would be most benefited by an opposite result; that the textile manufacturers, with whom the concoction and plagiary of patterns has always been a sort of mystery, have viewed with jealousy the attempt to educate pattern drawers by scores in every manufacturing town in the country. They see in all this abundant means of competition, but none of advancement; and knowing that art, as involved in design and colour, can only be successfully applied to manufactures by one who understands the technical details of the latter, in whatever branch it may happen to be, they have too generally refused to give their aid to the general cause by enlightening their students of art in the mysteries of their handicraft. Mr Thomson, of Clitheroe, in his evidence before a committee of the House of Commons, indeed, very clearly lays down the views which manufacturers have commonly entertained upon this subject, and we quote a passage from his evidence, the more readily as the committee in their report particularly refer to this witness, as "a gentleman of great taste and experience in manufactures." Mr Thomson says:—

"The manufacturers of England want educated designers; and they look to your schools for that instruction to our young men which will train the eye to an accurate perception of beauty, and form, and harmony of colour, and the hand to correct the delineation of it, and thus lay the most solid foundation for the application of design to that branch of industrial art in which the student decides afterwards to engage. In six months they will learn more technical skill relative to their own art in our workshops and manufactories, than you could teach them in six years at Somerset House. Besides, who is to teach them? Are you to have a master or professor of pattern drawing in every department of industry? for calico-printing and its subdivisions, furnitures, shawls, dresses? for silk-weaving in its subdivisions of rich damask furniture for kings and princes, dresses for the refined and the vulgar, and a hundred articles of fluctuating fashions in scarfs, shawls, ribbons, &c.? Where will you find the universal genius that is to teach all this? or will you have a master for each? You will advertise, and your small salary will bring you hosts of broken-down pattern-drawers of all sorts, who, though unable to get employment in a manufactory, or find a sale for their own designs, will yet boldly undertake to teach everything in your school. Beware how you excite the doubts and suspicions, and eventually lose the confidence of the manufacturers themselves, by failing, as you assuredly will do, in the attempt to do that which it is impossible you should ever succeed in."

Although it is two or three years since the above observations were made, we have reason to believe that they correctly describe the opinions and views of the great bulk of the manufacturers of this country, at the present moment, who have not yet got rid of all their apprehensions and misgivings about pattern-drawing and art-movement. If the concourse of genius and industry attracted to the Crystal Palace does no more than rub away a little of this rust of prejudice, it will have achieved a great and certain good to the whole industrial community of this country.

THE CEREMONIAL OF CLOSING THE EXHIBITION AND DECLARING THE PRIZES AWARDED.

THE following is generally believed to be the programme of the closing proceedings on the 11th prox.:—Seats will be provided, upon a raised stage in the centre of the transept, for the accommodation of Prince Albert and the other royal commissioners, and in the immediate neighbourhood for those invited to be present. The principal portion of the business transacted will consist in one of the council of chairmen—probably the chairman, Viscount Canning, announcing to the commissioners the awards of the prizes which the jurors have made, and stating the grounds upon which they have been given. Prince Albert, as president of the commission, will then, in all probability, on behalf of the royal commissioners, thank the jurors for the attention which they have bestowed upon the subject, and he will, no doubt, take that opportunity of alluding to the great success of the undertaking—the assistance which it has received from all classes of the community—the benefits to art, manufactures, and commerce which may be expected to flow from the lessons which it has taught—and the services of the foreign, metropolitan, and local commissioners and committees; and last, but not least, the cordial support and assistance rendered by the exhibitors will be duly acknowledged. It is not intended to admit the public upon this occasion, as accommodation for witnessing the ceremony and hearing the addresses could not be provided for a greater number of persons than the exhibitors, jurors, foreign and local commissioners, and members of local committees, whose presence it is intended to request. The distribution of medals will be a matter of after consideration, as comparatively few of those requiring the names of the owners to be stamped upon them will be ready for delivery by the 15th of October.

The programme of the closing was settled, and circulars are about to be issued to exhibitors, informing them that the building will be closed on the 11th; that on the 13th and 14th they will have the privilege of going there with two friends, and that on the 15th they are invited to be present at twelve o'clock at the meeting of the royal commissioners. By this arrangement the exhibitors will have the farewell view of the Crystal Palace, and a deference is thus shown to their labours and their sacrifices in its behalf, which we are sure they will not be slow to appreciate.

It is understood that Lord Seymour has intimated to the commissioners that the government would be prepared to sanction the purchase of a portion of the valuable collection of minerals and raw produce, for the purpose of completing the collection at Kew. The Russian government have also given instructions to their commissioner to purchase a similar collection for the Museum of St. Petersburg.

The lists of the successful competitors are in hand, but proceed slowly, as, it being intended that each person's name should appear in full on his medal, any mistake in the orthography (and that of some of them is very curious, as may be supposed), would be fatal to his fame.

The collection of records or memorials of the Exhibition is going on most favourably. They are to consist of specimens of raw materials, samples of textile fabrics, and drawings of the machinery and engineering inventions. The exhibitors take great interest in this collection, and are sending in contributions with great liberality and promptitude.

It is stated that numerous and valuable presents have already been made by exhibitors to the Royal Commission, for the formation of a permanent museum, after the present display in Hyde Park shall have terminated.

The fate of the Crystal Palace appears to be still undecided, but unless some royal interposition takes place the contractors will, certainly, commence and pull down the building as soon as the goods are cleared out.

or destruction by accident. Examine, also, the relative expense of putting the article in a working state when first purchased and brought home. These rules will be best understood by an illustration. Let us suppose a jury to be examining the relative merits of several cottage stoves for cooking. Of course, the first inquiry will be as to which admits of the best performance of the operations of boiling, stewing, roasting, broiling, baking, supply of hot water, ironing, &c. The cost of the fuel must not only be given, but also its weight, because the price of fuel varies in different localities. The capability of using different sorts of fuel in the several stoves, and the amount of fuel so consumed for its equivalent of coal, should also be stated. These and other comparative inquiries having been made, the durability of that part of the stove which is subjected to the direct action of the burning fuel must be examined. It will be made either of iron or of earthenware: and the relative merit of the various stoves will, as far as this point is concerned, consist in the facility and economy with which such parts can be removed, and the corresponding new parts be purchased and replaced in their proper position. It is always desirable for the consumer, that the vendors of such articles should keep a stock of the parts liable to wear out, and that the latter should undertake to replace them at a fixed price. Those parts of the stove which project so as to be liable to accidental blows, and those which are from their more constant use much exposed to accident, as the hinges and the latches of doors, should then be examined. These, if of cast iron or other brittle material, and constituting part of the substance of the door, should be sufficiently strong to resist fracture: if they are attached to it by rivets or otherwise, they will be lighter and stronger when made of wrought iron. The last inquiry is into the expense for fixing the stove for use. It may be set in brickwork, within the chimney, in which case it will require a bricklayer and a large mass of materials in the shape of bricks and mortar, and possibly of stone. Or it may stand on its own base containing its own ash-pit, and by means of a small iron pipe the smoke may be conveyed into a flue. In this case, almost any workman, with hammer and chisel and a small quantity of mortar or cement, can fix it ready for use. Again, the stop-cock for the water-cistern may be either hard-soldered, riveted, or screwed in. If the latter, it can easily be unscrewed or re-ground when necessary. The same remark applies to the leaden supply-pipe; it may be connected by soldering, or by a union joint. In the former case these parts will require the aid not only of the tinman or coppersmith, but also of the plumber.

"The expense of repairing a machine does not in all cases depend on the cost of the part replaced, or even on the actual cost of replacing that part alone. It often happened in the earlier days of locomotive engines, that the expense of some small reparation necessary to keep the machine in good working order did not amount to ten shillings; whilst the expense of removing and replacing other parts, without which the workman could not get at the defective part, amounted to fifty or eighty shillings, or even to a still larger sum. Thus, facility of getting at all the parts of an engine for the purposes of repair, or even of examination, is one of the advantages which the broad possesses over the narrow gauge.

"In many articles exposed to great or sudden force, and to much wear or tear, it is very desirable, that, if any breakage occur, it should happen at that point where the consequences would be the least dangerous to the persons using it, and the reparation of it least expensive.

"During a series of experiments made by the author, in 1839, on the Great Western Railway, it was necessary, amongst a variety of other curves, to cause a pen to draw upon long rolls of paper the curve described by the centre of a carriage, projected on the plane of the road. When everything is in proper order, this line ought to be parallel to, and in the middle between the two rails. But it is well known, that, instead of answering these conditions, it often describes a serpentine curve, arising from that snake-like motion of a train which the carriages acquire by rolling alternately towards each rail, until they are checked by the flanges pressing against it. To accomplish the drawing of the line above mentioned, it was necessary to have depending from the carriage a very stout jointed wooden arm, terminating in an iron shoe with a steel projection. This shoe was, by a powerful spring, pressed close to the rail in the middle point between the two side wheels of the carriage, and by a communication with the pen the required curve was described. But such an apparatus was exposed to very rough work, and, in fact, was generally broken three or four times during each experimental journey. If the broken part had fallen between the wheel and the rail, it might have caused a serious accident. To prevent this the following precautions were taken:—The wooden arm was strengthened with thin strips of iron, except at one part about an inch long. At this part a small notch was cut with a saw. The lower portion had a strong iron eye fixed into it, which was connected loosely to a hook by a rope passing through a hole in the middle of the carriage. Whenever the apparatus broke, it was always at the notch. The position of the loose rope holding the broken part was such, that the tendency was immediately to drag it into the middle of the road, under the centre of the carriage. This at once removed it from interference with the wheels. The pen describing the curve soon gave notice, by ceasing to move laterally, that the arm was broken; on which one of the assistants immediately took hold of the loose rope, and pulling the broken fragment close up to the bottom of the carriage, prevented the possibility of any further danger.

"If each jury were to explain concisely the means employed by them to examine the qualities of each class of objects submitted to them, much valuable information would result. A collection of these rules for the judgment or verification of articles, if reduced into order, and published in a small compass, by a competent person, at the close of the Exposition, would be invaluable to the public. The result would be beneficial to all *honest* tradesmen, and injurious only to the *fraudulent*. Such means, when put into the hands of the public, would soon enable it to distinguish the genuine from the sophisticated articles, and to select those which in point of excellence and durability are best suited to the means or wants of the purchaser. The increased knowledge of the public would be felt by the retail dealers, and would make them more anxious to obtain excellent and durable goods from the manufacturer.

MACHINERY & MECHANICAL CONTRIVANCES.

THE MACHINERY COURT.

THE annexed engraving presents a view of a portion of the Machinery Court, in which are comprised three of the most interesting engines for the transferring and modification of power for the purpose of lifting weights, &c.; namely, the great hydraulic press, which was used in raising the tubes of the Britannia Bridge, manufactured by the Bank Quay Foundry Company, Warrington; Armstrong's hydraulic machinery; and Henderson's patent Derrick crane.

The principles of hydraulics by which repeated increments of power may be stored and accumulated, in a reservoir of sufficient strength to retain this aggregation in the form of a certain bulk of water, was first applied to the hydraulic press, by Mr. Bramah, in 1796. It has since been applied to a variety of purposes, with signal success, both in lifting of enormous weights, and putting enormous pressure upon bales of goods, for the purpose of diminishing their bulk in packing. Before proceeding to describe the details of this machinery and its gigantic labours, it may be proper to warn inexperienced readers against a vulgar error which prevails sometimes, that power is made or gained by the use or intervention of machinery. Such is by no means the case:—no more power can be obtained from any machine than what is put into it, whether by manual, labour, the force of the elements, or the application of natural phenomena, as the explosion of gunpowder, the evaporation of water, the action of the electric fluid, &c. All that is obtained is the storing of small quantities until they become a bulk sufficiently large to be useful for the desired purpose. Five hundred men by repeated direct efforts, or by one simultaneous direct effort, could not lift the monument the eighth of an inch; but the power of one man continuously applied for a sufficient length through the medium of an hydraulic press, would be able to lift it and carry it across the river. In this process, however, so far from gaining power, some power is lost in the very working of the machinery, so much power, in fact, is as it were paid for the use of the engine required. To use a homely illustration of another character. You may accumulate successive penny instalments in a savings' bank till they amount to 100*l*., but you have to pay something for the accommodation. We proceed now to describe

THE GREAT HYDRAULIC PRESS.

The principal parts of this machinery are an iron cylinder, in which a piston works, at the bottom of which is a tube opening into it, with a valve closing downwards. The other end of this tube communicates with a small forcing pump, by which water is driven through the said valve, into the portion of the cylinder beneath the piston; which is, consequently, gradually forced up by it. By connecting the piston end with a set of chains, &c., supported from strong cross beams, any object, however great its might, (so that it be not greater than the constructive power of the machinery itself,) may be raised gradually but surely.

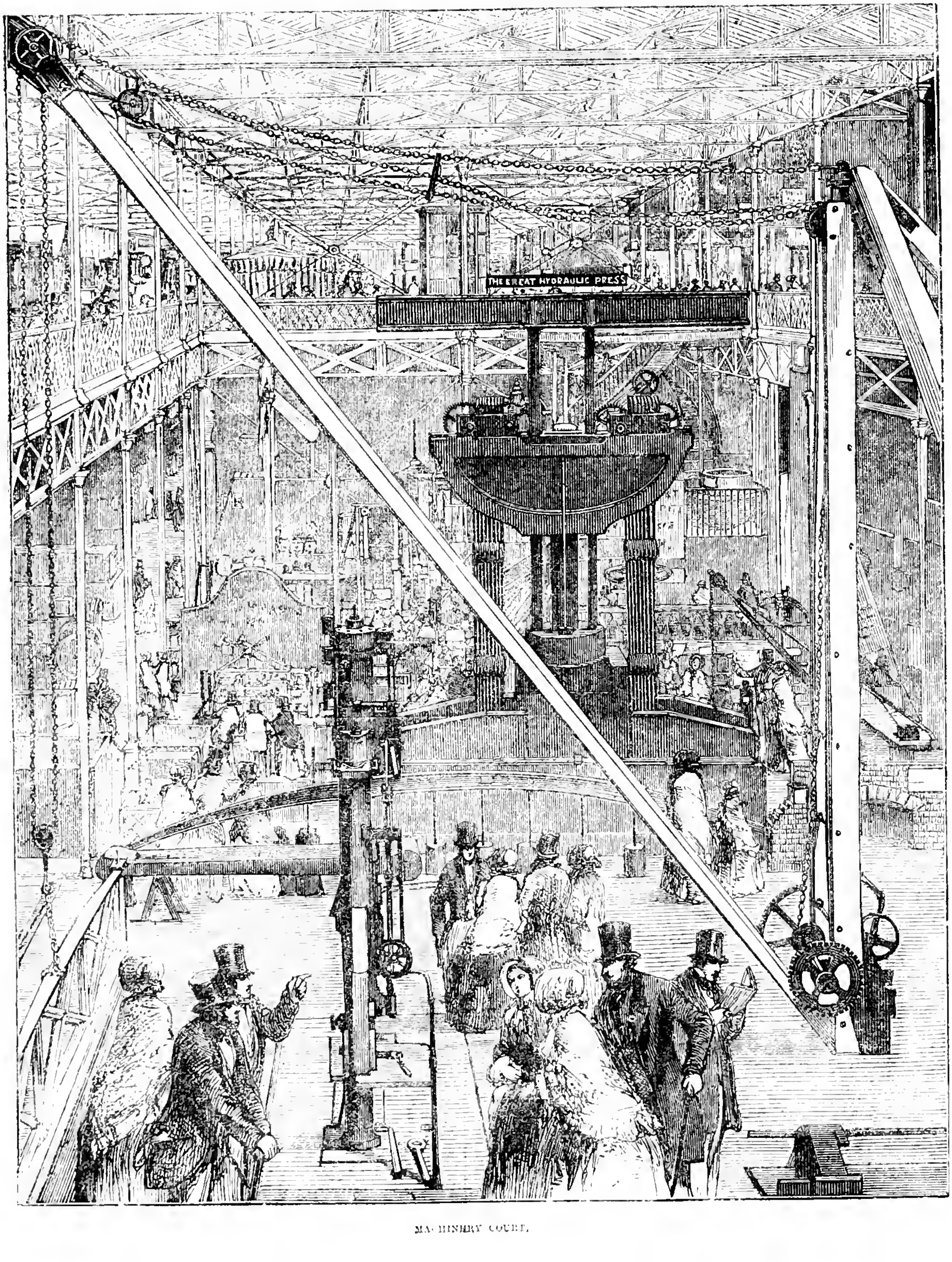
In the great hydraulic press now under consideration, the internal diameter of the cylinder is 22 inches, the diameter of ram is 20 inches, the external diameter of the cylinder is 42 inches, external length 9 feet $1\frac{1}{2}$ inch; thickness of metal 10 inches; the cast iron crosshead has wrought iron links let in at the top, for the purpose of strengthening the part subject to tensile strain; the sides of the jacket also are strengthened with wrought iron slabs, weighing 50 cwt. each, expanded first by heat and then fitted on hot, and allowed to contract. To cast the cylinder, it required 22 tons of fluid metal, the additional quantity beyond its finished weight being required for the head, or git, which weighed $2\frac{1}{2}$ tons. This head, or git, was kept in a fluid state for six hours after the run, by replacing the material after it became stiff, with metal fresh from the furnace, and of the highest attainable temperature, for the purpose of supplying the space in this immense body of metal below, consequent upon the contraction. In three days afterwards the cylinder was partly denuded of its outer coat of sand, when it was found red hot: in seven days it was lifted from the pit in which it was cast, and in ten days, or 240 hours, it was sufficiently cool to be approached by men well inured to heat, for the purpose of dressing the remaining sand off it.

The beams, for supporting the press, consisted of six vertical ribs of boiler plates, $\frac{11}{16}$ths thick, united by vertical strips, to preserve them in

form; the $2\frac{1}{8}$ inch spaces between ribs were filled with American elm, so that the vertical rib was a sandwich of elm and iron. The top and bottom flanges were each formed by twelve wrought iron bars, extending the whole length of beam. The top bar 7 inches wide, the bottom bars 9 inches by $1\frac{1}{8}$ inch; the whole rivetted together. The weight of each girder was 12 tons. In order to prevent the crushing at the ends, cast iron plates were inserted instead of the wood.

The weight actually supported by one pair of beams was 1717 tons, but they were capable of sustaining 2000 tons. The length between the bearing was 17 feet 4 inches. The ram was cast hollow and turned to bed truly, beneath the crosshead, which was bored to receive it. The crosshead was guided by two wrought iron rods, 6 inches diameter, fitted in sockets on the top of the press, and keyed above into a cast iron girder, built in the masonry.

There were two sets of clamps: the one placed on the crosshead and rising with it, was immediately used for lifting the chain and tube, the under set was fixed on the cast iron girders which support the press, and was used for securing the chain at the end of each lift, while the press was lowered, and the upper set of links removed: they are in all respects similar to each other. The wrought-iron clamping cheeks are slotted to fit closely beneath the slotted shoulder in the head of the links; they are withdrawn or closed by right and left handed screws, on turning which



MACHINERY COURT.

the cheeks recede from each other, or are drawn into close contact with the chain. To insure a parallel action, the screws are moved simultaneously by a winch and gearing; they are thus easily worked by one man. Thus at each stroke of the press the tube was raised 6 feet, the time occupied in one lift being usually from 30 to 45 minutes.

The lifting chains were manufacted by Messrs. Howard and Ravenhill; the clamps and valves by Messrs. Easton and Amos. The superintendence of the designs and construction of this machinery were entrusted by Mr. Robert Stephenson, the engineer, to Mr. Edwin Clark.

The greatest weight lifted by the press at the Britannia bridge was 1144 tons; the quantity of water used for each 6 feet lift $81\frac{1}{2}$ gallons. "The pressure at 3 tons per circular inch, equals 3·819 tons per square inch, which would raise a column of water 5·41 miles in height; this pressure would, therefore, be sufficient to throw water over the highest mountains of the globe." This extraordinary fact is derived from Mr. Edwin Clark's work on the Britannia and Conway bridges. The following additional extract shows indirectly the vast power of this machine:—

"If it were required that 1lb. should raise the tube, or 2000 tons, then one arm of the lever must be 448,000 times as long as the other; but if the 1lb. move through the space of one inch, the tube will be only lifted $\frac{1}{448000}$th part of an inch; and in order to raise the tube 100 feet, the pressure of 1lb. must be continued through a space of 83,522 miles; and, conversely, a pressure of 2000 tons through a space of 100 feet, would raise 1lb. 83,522 miles; thus the descent of a clock-weight through a space of 6 feet overcomes the friction of the machine, and moves the extremity of an ordinary seconds-hand through a space of two miles in a week, and the descent of the tube to the water would maintain the going of an ordinary clock for 240,000 years," or the power expended by the press in lifting the tube 100 feet, if applied to an ordinary clock, would work it for a period of 240,000 years.

"After the first tube was raised, the cylinder met with an accident, described in the following terms by Mr. Clark:—

"In a little more than a fortnight after this operation, the presses were removed ready for raising the next tube. They were lowered and raised again by means of capstans, with an 8-inch rope: and in this operation another accident occurred with the unlucky press. The cylinder was lowered from a cat-head at the top of a tower; the rope from the blocks led to a capstan on the beach, on which three turns only were taken; while the cylinder, weighing 15 tons, was suspended at an elevation of 140 feet above the water, the rope unexpectedly surged on the capstan, and was dragged out of the hands of the men who were holding it: the cylinder descended with fearful velocity, dragging the rope through the block tackle and round the capstan, which fortunately became palled by the jerk. As the velocity increased, the cat-head in the tower gave way, and the cylinder fell on the stone shelf below, fracturing the masonry, and gliding off 50 or 60 feet in the Straits. Several men were injured, and a sailor who was serving out the coil of rope was dragged round the capstan and killed. None of the tackle was broken, and the press was easily raised by the ropes attached to it, and was found to be uninjured by the fall."

ARMSTRONG'S HYDRAULIC HOISTING MACHINERY.

Nearly opposite to the great hydraulic press, are working models of Mr. W. G. Armstrong's Hydraulic Hoisting Machines: the principles illustrated by which are, first, "the transmission of power" from a steam-engine to distant points, by means of water conveyed in pipes at a high pressure; and, secondly, "the accumulation of power" by the intervention of a reservoir, which enables the continuous action of a small steam-engine to meet momentary demands of power greatly exceeding its direct capability. The substitution of steam power for manual labour in docks, for the purpose of discharging ships, hoisting goods into warehouses, and opening and shutting lock gates, sluices, and swing bridges, is an object much to be desired, but difficult of attainment by ordinary means. To effect these purposes by the direct application of a multiplicity of steam-engines scattered over the premises would involve an amount of complication and encumbrance which would be quite inadmissible; and to transmit the required power by the common expedient of shafting, is not only attended with much mechanical difficulty, where the distance is considerable, but is incompatible with any system of accumulating power beyond the extent that may be accomplished by means of a fly-wheel. The employment, however, of hydraulic pressure as a medium of transmission removes these difficulties, and affords the additional advantage of a steadier, safer, and more controllable action than is attainable by any other means. The models are so arranged upon a table as to be worked by a small steam-engine. By means of this engine, the water is forced into the "accumulator," which is a species of press loaded with weights, maintaining a pressure upon the water within, and thus imparting to it the same mechanical efficacy that a head of great altitude would afford. From the accumulator the water is conveyed in a pipe to the hoisting machines, and when these consume more water than the engine at the moment supplies, the excess is furnished by the accumulator; but when, on the other hand, the machines use less water than is pumped by the engine, the surplus is received by the accumulator, which thus gathers power to meet subsequent demands. When the water has produced its required effect, it returns to the pump well, to be forced up again into the accumulator, so that the same water continues in circulation without material waste. It is also to be observed that the accumulator, by a connection with the steam-valve, acts as a governor to the engine causing it to quicken its speed when power is wanted, and to retard the motion when the production of power is greater than necessary.

The models of the hoisting machines comprise three specimens, viz. 1st. A machine for discharging coal ships, in which a vibrating jib is employed to carry the coal tub forwards and backwards. 2nd. A hydraulic swing crane, which lifts and lowers a large cast iron ball, and turns round with it either to the right or to the left, as directed by the attendant. 3rd. A machine for lifting corn stacks into warehouses, which works two ropes, the range of which is readily adjustable to any floor of the building.

In all these machines the general principle of construction is the same, the lifting action being produced in each by the pressure of the water upon a piston, or plunger, which acts upon the chain, through a system of pulleys, which multiply the motion, and give to the chain an increase of travel proportionate to the number of the pulleys. The traversing motion of the jibs is also effected by the pressure of the water upon a piston, and suitable valves are employed to regulate the various actions.

HENDERSON'S PATENT DERRICK CRANE.

The Derrick cranes, patented by Mr. David Henderson, are extensively used in many large establishments, especially in the North of England. They were called into operation with signal good success in the course of the building of the Crystal Palace, when testing the girders by means of the Hydraulic Machine. There are, altogether, six varieties of these cranes, numbered from 1 to 6; that represented in the View being one of those known by the Number 4, the power of which is from two to four tons, and the radius of range from 25 to 45 feet. Some of the advantages obtained by this description of machine over the ordinary form of derrick crane, are the facility with which a load can be moved nearer to, or farther from the centre of the crane, and deposited at any point of the space included within the range of the derrick; and increased safety while raising or lowering the derrick, whereby extra labour is saved in bringing the load to its original level.

In the derrick fixed at the "Industrial Palace," three fourths of the circle included within the sweep of the crane is obtained, while the remaining fourth of the circle is likewise available, if logs of timber, or long lengths of iron, &c., are required to be moved. The derrick crane consists of the stem, derrick, and the stays—usually made of timber, but which may, if desired, be constructed of wrought iron.

The stem consists of two pieces of timber, which meet at top, and are connected both at top and bottom by means of cast iron shoes. The lower shoe is constructed so as to turn on a fixed gudgeon; and the upper shoe is also fitted with a gudgeon, by which it is connected with the pair of stays, and which enables it to be turned freely round. The crab-engine, as shown in the View, is worked by three men, and is fixed at the bottom part of the stem, the roller, or chain-barrel, being fixed between the two parts of which it is composed. The stays are fixed at their lower ends by being attached to horizontal sleepers, which meet at the centre of the crane, and support the lower gudgeon of the stem.

The derrick, which is constructed of a single piece of timber, has a cast-iron shoe at the top, and another at the bottom, the lower end being jointed by a pin to the bottom shoe of the stem, so as to enable it to be moved vertically. Winch-handles, with wheels for single and double purchase, together with the barrel, form one part of the crab; while the other part, which raises or lowers the derrick, consists of a barrel and two wheels, by which it is connected with the first portion of the crab—the necessary connection being effected by means of a clutch fixed on the spindle of the lift barrel. The derrick is supported by a chain, passing from its barrel up the stem to a pulley at the top. From this pulley it is carried nearly to the top of the derrick, to which, in the present instance, it is fixed; but, in some of the other forms, passes over a snatch-block attached to the derrick, and, returning to the stem, it is securely fastened to the upper end of the top gudgeon. The left chain passes up the back of the derrick, from its barrel, to a pulley at top, and thence down to the load. In order to prevent the derrick barrel from turning, the two portions of the crab are disconnected—the derrick being supported by a catch, or pall, which acts on one of the coupling-wheels. When the two parts of the crab are disconnected, the crane is in a proper state to be used in raising its load; and when it is necessary to move the load nearer to the centre of the crane, the two barrels are again connected, simply by means of the clutch, the motion of the crab being reversed. When the load has been moved nearer to the centre of the crane, it is necessary to raise the derrick. The coupling-wheels are so proportioned, that the lift chain is unwound as much as the point of the derrick is raised, and thus the load is moved horizontally. When it is required to lower the derrick, the lift chain is wound up, and the horizontal motion of the load is still preserved. The chain barrel is tapered, the increased diameter of the barrel moving the derrick through a larger range in its higher position, in proportion to the length of the lift-chain unwound, by which the load retains its horizontal position while in motion.

HISTORY OF THE GREAT EXHIBITION OF 1851.

II.—The History of the Crystal Palace.

We come now to consider the arrangements by which the Great Exhibition has received not only a local habitation, but a name;—the origin and history of the Crystal Palace. We shall begin by quoting the statement in the Official Catalogue:—

"As early as January, 1850, the Commission named a Committee 'for all matters relating to the Building,' consisting of the Duke of Buccleuch, the Earl of Ellesmere, Mr. Barry, R.A., Mr. Cubitt, *Pres. Inst. C.E.*, Mr. Stephenson, Mr. Cockerell, R.A., Mr. Brunel, and Mr. Donaldson.

"Mr. Cubitt was elected Chairman of this Committee, and from the earliest period to the opening of the Exhibition, has given daily and unremitting attention to the subject, at great personal sacrifice of his valuable time. On the 21st of February, 1850, the Building Committee reported favourably on the fitness of the present site in Hyde Park, which had been suggested in the early stages of the undertaking, and for the use of which it had been already announced that Her Majesty's permission had been obtained. The Committee ventured at once to recommend that upwards of 16 acres should be covered in: a bold step at that time (21st February), when no data whatever of the space likely to be filled had been received (*Min.* vii., p. 5). It was their opinion that it was desirable to obtain suggestions, by public competition, as to the general arrangements of the ground plan of the Building, and public invitations were accordingly issued. They also reported that when a plan for the general arrangement should have been obtained and approved, they would invite, by a second public notice, designs accompanied by tenders, from the builders and manufacturers of the United Kingdom, for the construction of the Building, in the form, and according to the general arrangement, which should be fixed upon. In answer to the invitation to send in plans, upwards of 245 designs and specifications were submitted. Of these 38 were contributed by foreigners: France sending 27; Belgium 2; Holland 3; Hanover 1; Naples 1; Switzerland 2; Rhein Prussia 1; Hamburg 1: 128 by residents in London and its environs; 51 by residents in provincial towns of England; 6 by residents in Scotland; 3 by residents in Ireland; and 7 were anonymous. All these plans were publicly exhibited during a month, from the 10th of June, at the Institution of Civil Engineers, Great George Street, Westminster. The Building Committee reported on the merits of them, selecting two lists of the competitors. They considered the one 'entitled to favourable and honourable mention,' and the second 'entitled to further higher honorary distinction.' But they accompanied their report with the important announcement, that in their opinion there was no 'single plan so accordant with the peculiar objects in view, either in the principle or detail of its arrangement, as to warrant them in recommending it for adoption' (*Min.* xvii., p. 6). The Committee, therefore, submitted a plan of their own, and assisted by Mr. Digby Wyatt, Mr. Charles Heard Wild, and Mr. Owen Jones, they prepared extensive working drawings, which were lithographed. They issued invitations for tenders to execute works in accordance with them, requesting from competitors, in addition, such suggestions and modification, accompanied with estimates of cost, as might possibly become the means of effecting a considerable reduction upon the general expense. In the actual instructions they stipulated that tenders, in which changes were proposed, would be only entertained provided they were 'accompanied by working drawings and specifications, and fully priced bills of quantities.'

"The Building Committee published in detail the reasons, both of economy and taste, which had induced them to prepare plans for a structure of brick, the principal feature of which was a dome two hundred feet in diameter. Public opinion did not coincide in the propriety of such a building on such a site, and the residents in the neighbourhood raised especial objections. The subject was brought before both Houses of Parliament; and in the House of Commons, on the 4th July, 1850, two divisions took place on the question, whether the proposed site should be used at all for any building for the Exhibition. In the one division, the numbers in favour of the site were 166 to 47, and in the second 166 to 46. The Commissioners published, at considerable length, a statement of the reasons which had induced them to prefer the site, and there can be no doubt that the force of this document mainly influenced the large majority in both divisions.

"Whilst the plan of the Building Committee was under discussion, Mr. Paxton was led, by the hostility which it had incurred, to submit a plan for a structure chiefly of glass and iron, on principles similar to those which had been adopted and successfully tried by him at Chatsworth. Messrs. Fox, Henderson, and Co., tendered for the erection of the Building Committee's plan, and strictly in accordance with the conditions of tender, they also submitted estimates for the construction of the building suggested by Mr. Paxton, and adapted in form to the official ground plan. An engraving of Mr. Paxton's original design was published in the *Illustrated London News*, 6th July, 1850, which when compared with the building that has been actually erected, will show what changes were subsequently made. The Commissioners having fully investigated the subject, finally adopted, on the 26th July, Messrs. Fox, Henderson, and Co.'s tender to construct Mr. Paxton's building, as then proposed, for the sum of 79,800*l.* Considerable modifications, additions, and improvements in the architectural details were subsequently made, which have raised the proposed original cost of the building. As soon as the decision was made, fresh working drawings had to be prepared, and every means taken for expediting the works. These were carried on under the superintendence of Mr. Cubitt, assisted by Mr. D. Wyatt, Mr. O. Jones, and Mr. C. Wild. The formal deed of contract was not signed until the 31st October, although the first iron column was fixed as early as the 26th September, 1850, the contractors having thereby incurred, in their preparations, a liability of 50,000*l.* without any positive contract; in fact, great reciprocal confidence was manifested by the contracting parties. Whatever objections were entertained originally against the use of the site, gradually disappeared during the progress of the present building, and have become changed into positive approval and admiration, of the building itself and assent to the particular location of it. It should, however, be stated that a deed of covenant, to remove the building and give up the site within seven months after the close of the Exhibition, namely before the 1st June, 1852, has been entered into between Her Majesty and the Commissioners. The deed was sealed on the 14th November, 1850."

Mr. Paxton, at a meeting of the Derby Institute, gives the following graphic and amusing narrative of the affair:—

"It was not," says he, "until one morning, when I was present with my friend Mr. Ellis, at an early sitting in the House of Commons, that the idea of sending in a design occurred to me. A conversation took place between us, with reference to the construction of the New House of Commons, in the course of which, I observed, that I was afraid they would also commit a blunder in the building for the Industrial Exhibition; I told him that I had a notion in my head, and that if he would accompany me to the Board of Trade, I would ascertain whether it was too late to send in a design. I asked the Executive Committee whether they were so far committed to the plans as to be precluded from receiving another; the reply was, 'Certainly not; the specifications will be out in a fortnight, but there is no reason why a clause should not be introduced, allowing of the reception of another design.' I said, 'Well, if you will introduce such a clause, I will go home; and, in nine days hence, I will bring you my plans all complete.' No doubt, the Executive thought me a conceited fellow, and that what I had said was nearer akin to romance than to common sense. Well, this was on Friday, the 11th of June. From London I went to the Menai Straits, to see the third tube of the Britannia Bridge placed, and, on my return to Derby, I had to attend to some business at the Board Room, during which time, however, my whole mind was devoted to this project; and, whilst the business proceeded, I sketched the outline of my design on a large sheet of blotting-paper. Well, having sketched this design, I sat up all night, until I had worked it out to my own satisfaction; and, by the aid of my friend, Mr. Barlow, on the 15th, I was enabled to complete the whole of the plans by the Saturday following, on which day I left Rowsley for London. On arriving at the Derby station, I met Mr. Robert Stephenson, a member of the Building Committee, who was also on his way to the metropolis. Mr. Stephenson minutely examined the plans, and became thoroughly engrossed with them, until at length he exclaimed that the design was just the thing, and he only wished it had been submitted to the Committee in time. Mr. Stephenson, however, laid the plans before the Committee, and at first the idea was rather pooh-poohed; but the plans gradually grew in favour, and by publishing the design in the *Illustrated London News*, and showing the advantage of such an erection over one composed of fifteen millions of bricks and other materials which would have to be removed at a great loss, the Committee did, in the end, reject the abortion of a child of their own, and unanimously recommended my bantling. I am bound to say, that I have been treated by the Committee with great fairness. Mr. Brunel, the author of the great dome, I believe was at first so wedded to his own plan, that he would hardly look at mine. But Mr. Brunel was a gentleman, and a man of fairness, and listened with every attention to all that could be urged in favour of my plans. As an instance of that gentleman's very creditable conduct, I will mention, that a difficulty presented itself to the Committee as to what was to be done with the large trees, and it was gravely suggested that they should be walled in. I remarked, that I could cover the trees without any difficulty; when Mr. Brunel asked, 'Do you know their height?' I acknowledged that I did not. On the following morning, Mr. Brunel called at Devonshire-house, and gave me the measurement of the trees, which he had taken early in the morning, adding, 'Although I mean to try to win with my own plan, I will give you all the information I can.' Having given this preliminary explanation of the origin and execution of my design, I will pass over the question of merit, leaving that to be discussed and decided by others, when the whole shall have been completed."

Mr. Fox, at a dinner given to him at Derby, June 28th, made a speech, giving the following interesting particulars of the actual progress of the works:—

"In June, 1850, the Royal Commission invited contractors to tender for a building to be erected in Hyde Park, in conformity with plans and specifications prepared by the Building Committee.

"The Building, which was intended to consist principally of brick and iron, with a splendid dome in the centre, was considered of too permanent a nature for subsequent removal, and public opinion to this effect was very generally expressed.

"In the printed conditions of tender issued by the Building Committee, the following clause was introduced:—

"'Tenders for methods of construction other than those shown upon the drawings, and described in the specifications will be entertained, but on condition only of their being accompanied by working drawings and specifications, and fully priced bills of quantities.'

"This invitation to parties to send in tenders, based not only on the Committee's plans, but upon such other designs as they might wish to submit, induced me to believe that a tender for a building of glass and iron, as suggested to me, for the first time, by Mr. Paxton, on the 22nd June, 1850, just twelve months ago, an engraving of which was published in the *Illustrated London News* on the 6th of July, would meet not only with the approbation of the Building Committee, but with that of the public at large; and I therefore went to Birmingham on the 25th June, and put in hand the drawings and specifications upon which our tender to the Committee was to be based.

"On the 2nd of July, Mr. Cole, having heard of our intention to make an offer for a building of the kind, and feeling strongly that the success of the Exhibition depended upon having an attractive and suitable building, came down to Birmingham, at his own suggestion, but with the permission of competent authority, to stimulate us to proceed, and to offer such hints in reference to the requirements of the case as would enable us to make the conception of Mr. Paxton conform strictly to the condition of tender required by the Commissioners, and therefore most likely to meet with the approbation of the Building Committee; and I am of opinion, that to his spirited advice we are mainly indebted for obtaining an impregnable *locus standi* on the merits of our case.

"In all this I had the co-operation of my partner, Mr. Henderson, who, feeling with me the value of Mr. Cole's suggestions, and the great importance in the preparation of these drawings, of conforming as much as possible to the arrangements adopted by the Committee in the plan upon which they had invited tenders, proposed the addition of the transept, in the propriety of which Mr. Paxton, after due consideration, entirely concurred.

"Before completing our tender, and with a view to a more precise appreciation of the magnitude of a building covering 18 acres—1850 feet long, 408 feet wide, and 64 feet high, irrespective of the arched roof of the transept—I walked out one evening into Portland-place; and there setting off the 1850 feet upon the pavement, found it the same length within a few yards; and then, considering that the building would be three times the width of that fine street, and the nave as high as the houses on either side, I had presented to my mind a pretty good idea of what we were about to undertake, and I confess that I considered the difficulties to be surmounted in constructing that great Palace were of no ordinary kind; but feeling confident that, with great energy, good arrangements, and a hearty co-operation on the part of our extensive and well-disciplined staff, it might be accomplished, and that upon it depended, in all probability, the success of the Exhibition, we determined to undertake the responsibility; and the opening on the 1st May has proved the correctness of our conclusions.

"The plans and specifications prepared by us in great haste were submitted to the Commissioners, together with a tender, on the 10th July; but, though sufficient to enable us to bring the subject before them, and to convey to their minds an idea of what we proposed to erect, they were necessarily very incomplete, and did not contain either sufficient architectural or mechanical detail to admit of their being used in the execution of the works. The arched roof was afterwards added to the design, and submitted to the Commissioners on the 15th July, with the view of getting over a difficulty which existed in consequence of the elm-trees being too tall to be covered by the flat roof proposed by Mr. Paxton.

"These trees were, as Professor Cowper stated in his admirable lecture on the last day of the past year, 'John Bull's Trees of Liberty,' upon which, for some reason, he had set his heart in preference to all others, and would not consent to their removal. For the expense attending the addition of the arched roof to the transept, Fox, Henderson, and Co. did not increase the amount of their former tender, and it was consequently executed at their sole expense.

"The Building Committee, having had the matter under their consideration from the 15th to the 25th July, resolved unanimously to recommend the Commissioners to accept our offer for the building with the arched roof, and nothing could be more disinterested than their conduct in setting aside the drawings and specifications which, with much labour, they had prepared, and adopting others which, though laid before them in so imperfect a state, presented to their minds, as experienced engineers and architects, the mode of constructing a building of iron and glass better fitted for the purposes of the Exhibition.

"On the recommendation of the Building Committee, the Commissioners on the 26th July were pleased to signify their wish for us to construct the building, but were met by a difficulty which threatened to postpone for a year, if not to put an end to the Exhibition altogether.

"The Solicitor to the Treasury gave as his opinion that, until the Commissioners had obtained a royal charter, they could not legally proceed, and were therefore not in a position to give an order to any one. These circumstances were explained to us by Lord Granville on the 26th of July, in the presence of the Commissioners, who at the same time told us that it was their fixed intention to apply to Government for the charter, and he had every reason to believe it would be granted; and having informed us that as soon as they were a legally constituted body they would probably conclude a contract with Fox, Henderson, and Co., finishing by asking whether, under these circumstances, we should consider it running too great a risk to enter at once upon the execution of the work, as otherwise many weeks would unavoidably be lost, and the chance of opening the Exhibition on the 1st of May placed beyond possibility. In reply to his Lordship's inquiry, seeing the imperative necessity for immediate action, and desiring to render all the assistance in our power in furtherance of the important objects of the Exhibition, we expressed our willingness to run the risk, whatever it might be, and without waiting for the charter commenced at once the drawings and the necessary operations for the erection of the building.

"As the time for the execution of the Building was so extremely limited, and being well aware, from experience, that when matters of business had to be decided by a committee composed of many persons, much valuable time was generally wasted, we requested the Commissioners, instead of referring us to the Building Committee, to select one of its members, either the chairman, Mr. Cubitt, President of the Institution of Civil Engineers, Mr. Robert Stephenson, or Mr. Brunel, and give him absolute power to settle with us finally all matters connected with the arduous task we were then willing to enter upon. The Commissioners, appreciating the importance of this request, appointed Mr. Cubitt to fill this office.

"It was now that I commenced the laborious work of deciding upon the proportions and strengths required in every part of this great and novel structure, so as to ensure that perfect safety essential in a building destined to receive millions of human beings—one so entirely without precedent, and where mistakes might have led to the most serious disasters. Having satisfied myself on these necessary points, I set to work and made every important drawing of the Building as it now stands with my own hand; and it was no small source of gratification to me, when asking Mr. Cubitt to look over the drawings I had prepared, to find that he not only had no desire to suggest alterations, but expressed his entire approbation of them all.

"The Commissioners having carefully considered the merits of the various sites proposed for the Exhibition, amongst which may be named Leicester-square, Somerset House, Trafalgar-square, the Isle of Dogs, Battersea-fields, and Regent's-park, selected, after the most careful consideration, a portion of Hyde-park, situated between the Serpentine River and the Queen's Drive, and gave us possession of the ground on the 30th of July, when we proceeded to take the necessary levels and surveys, and to set out with great precision the position of the various parts of the building.

"The drawings occupied me about eighteen hours each day, for seven weeks, and as they came from my hand Mr. Henderson immediately procured the iron work and other materials required in the construction of the Building.

"As the drawings proceeded, the calculations of strength were made, and as soon as a number of the important parts were prepared, such as the cast iron girders and wrought iron trusses, we invited Mr. Cubitt to pay a visit to our works at Birmingham, to witness a set of experiments in proof of the correctness of these calculations. We first placed upon each part the greatest load it could ever in practice receive, and proceeded to show that above four times that load was required before fracture would occur. These proofs were made on the 6th September, when Mr. Cubitt was pleased to state that he never witnessed a set of experiments of a more conclusive nature. Being thus satisfied by actual experiment that the proportions of the various parts of the Building were such as to ensure perfect stability and safety, the preparation of the iron work and other materials was pushed forward with the greatest vigour, and large deliveries were made in the Park within the next three weeks; so that on the 26th September we were enabled to fix the first column in its place. From this time I took the general management of the Building under my charge, and spent all my time upon the works, feeling that, unless the same person who had made the drawings was always present to assign to each part as it arrived upon the ground its proper position in the structure, it would be impossible to finish the Building in time to ensure the opening on the 1st of May, and I am confident that if any other course had been taken, or if, as is usual in the construction of large buildings, the drawings had been prepared by an architect, and the works executed by a contractor, instead of, as in the present case, these separate functions being combined by my making the drawings and then superintending the execution of the work, a building of such dimensions could not have been completed within a period considered by experienced persons altogether inadequate for the purpose.

"The erection of the Building, now fairly commenced, was pushed forward with all possible speed, and a good notion of the amount of work may be obtained from the fact that at one period we fixed as much ironwork every day as would be required in a roof of equal extent to the passenger station of this town, which is one of the largest in the kingdom.

"It was not until the 31st of October that the contract with the Commissioners was completed; up to which time we not only had received no order for the Building, and no payment on account of the work we had done, but we had run the risk of expending upwards of 50,000*l.* without being in a legal position to call upon the Commissioners for any portion of the sum we had so expended; and such was the appreciation of our conduct in this matter, that Lord Granville was pleased, in the presence of the other members of the Commission, to state, on the 6th of November, that they were of opinion, that, but for the courage evinced by Fox, Henderson, and Co., in commencing the work without any order from the Commis-

sioners, the Exhibition of Industry of all Nations would never have taken place.

"Perhaps the most difficult and hazardous, and certainly the most interesting portion of the work, was raising the sixteen ribs of the transept to their places. A month was the shortest time assigned by any one for this operation. We commenced on the 4th of Dec., and succeeded in raising two in the course of that day.

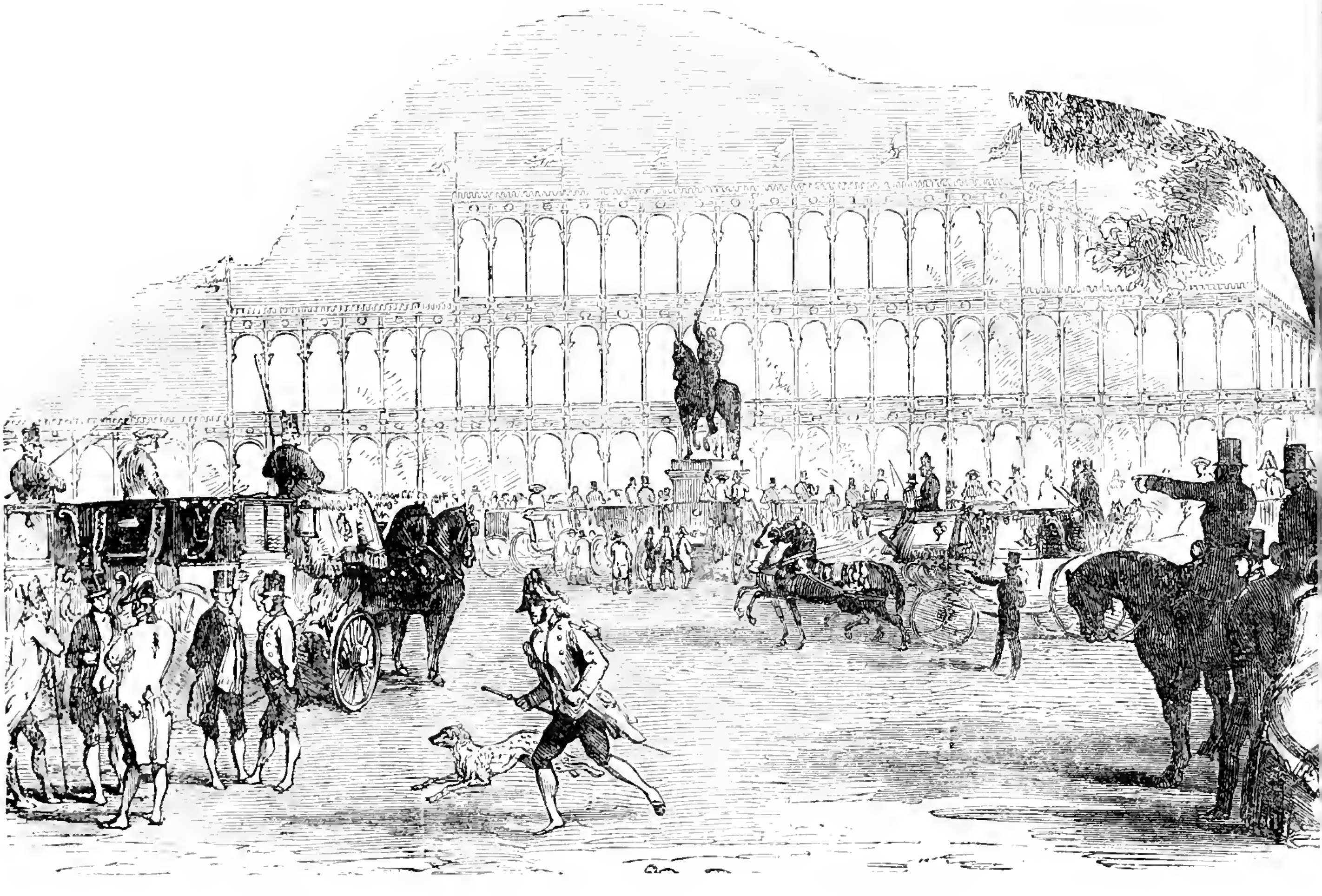
"Two more were safely deposited in their places in the presence of his Royal Highness Prince Albert on the following day, and the last pair on December the 12th; so that the sixteen ribs were all placed in eight working days.

"As the Building progressed, I was assailed on all sides, not only by unprofessional persons, but by men of high scientific attainments, who, notwithstanding the careful calculations which had been made, and the satisfactory proofs to which all the important parts were individually subjected, as soon as these parts were put together, producing a structure of unparalleled lightness, doubted the possibility of possessing, as a whole, that strength which was necessary to make it safe against the many trying influences to which it must necessarily be subjected.

"One gentleman, after complimenting me upon the beautiful appearance of the Building, stated his belief that it would never come down unless it tumbled down, and which he had no doubt, in his own mind, it would; or that the first gust of wind would blow it down like a pack of cards. Another, holding a high scientific appointment under Government, after a long investigation of the various parts of the Building, expressed at the Institution of Civil Engineers, a belief in the entire want of safety in its construction; and after explaining the mode of connecting the girders with the columns by means of projections technically called snugs, went on to indulge in an *airy* prophecy that a wind exerting a force equal to 10 lbs. per superficial foot would bring such a strain upon these snugs as to break them all off, and cause them to fall down in showers. I may just remark, that, since the expression of this opinion the wind-gauges around London have registered, in the late storms, upwards of 20 lbs. per foot; and I have pleasure in informing you that the encouraging predictions of this gentleman, as well as those of many others, have not been fulfilled.

"In fact, statements of this kind were so frequent and pointed, that we were often seriously advised to reply to them; but feeling confident we were right, and that we should succeed in all we had undertaken, and that the more people spoke against us the more complete would be the reaction in our favour, we abstained from taking any notice of what was said, leaving the public to judge of the matter by the result."

MR. FOX, CONTRACTOR FOR THE CRYSTAL PALACE.



WESTERN END.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

THE LAST DAYS OF THE EXHIBITION.

THE last days of the Exhibition have passed off in a manner at once gratifying and surprising. Everybody was prepared for a great accession of numbers to the usual average of shilling visitors, but the most extravagant expectations could hardly have anticipated anything so remarkable as the actual reality. On Monday, 107,815 people entered the building, and 5175*l.* 16*s.* was taken at the doors. On Tuesday, there were 109,915 visitors, and 5231*l.* 10*s.* taken at the doors. On Wednesday, 109,760 visitors, and 5283*l.* 3*s.* taken at the door. On Thursday (a very wet day), 90,813 visitors, and 4341*l.* 7*s.* 6*d.* taken at the doors.

Facts so astounding speak for themselves, and derive no additional force from expatiating upon them. Were it not so, we should despair of describing the scene which the interior presented. Popular demonstrations are always grand. Taking place in such an arena they exercise a transcendant and overpowering influence. In the presence of such an assemblage of human beings the highest triumphs of industry and art are forgotten, and the mind has only time to think of that great mass of humanity tendering its homage at the shrine of Labour, and vindicating the nobility of toil. If any lingering doubts have been entertained that the Crystal Palace has not been popular among the masses, its closing hours will set them completely at rest. That nearly 110,000 people should within one day and under one roof have enjoyed the grandest spectacle that the world has ever witnessed is of itself a sufficient marvel, but that they should have done so without a single known casualty to life or property is almost incredible. So, however, it is, and we leave to revolutionary and discontented minds the study of facts which place in so clear and unquestionable a light the love of order and the genuine kindliness of spirit which pervade all classes of our population.

No. 3, OCTOBER 18, 1851.

THE ROAD TO THE EXHIBITION.—HYDE PARK CORNER.

PRICE ONE PENNY.

Nothing like it has ever been witnessed before, nor can such a spectacle be soon repeated. The excitement was not confined to the building itself, but was manifested in every part of the metropolis. The six railway termini were regularly choked up with arrivals from the country. Omnibuses were filled inside and out with a rapidity which far outstripped the zeal of their conductors, and a courage which set the weather and all other dangers and discomforts at defiance. Cabs were frequently not to be had on the best attended stands, and the thoroughfares leading to Hyde-park were swept throughout the day by a continuous and inexhaustible stream of public and private conveyances of all descriptions, including innumerable vans and carts. Where they all came from was the wonder, nor could the stranger help admiring the marvellous dexterity with which this moving panorama of life was directed in its perplexed and hazardous course. Amid all the apparent hubbub and confusion order prevailed, and so complete were the arrangements for preventing injury to life and limb, and for securing the passenger traffic of the streets, that at the principal crossings policemen were stationed to watch over the safety of the timid and the aged. Till long after midday the pavements on either side along Piccadilly, and from Hyde-park-corner and up Sloane-street to Knightsbridge, were swarming with dense black columns of pedestrians, all wending their way to the Crystal Palace. Within, the vast area of the nave and transept could be compared to nothing so aptly as to a stupendous beehive: it was alive with human beings, who moved to and fro and defiled along side aisles, and clustered in courts and galleries, while the hum of their voices and the sound of their footfalls rose in one continuous swell upon the ear, impressing upon the mind of the listener mingled sentiments of awe and mystery.

An incident occurred on Monday, however, which for a moment occasioned some little anxiety, not to say alarm, yet from a cause which no effort of prudence could have prevented. When the crowd assembled within the building was at its culminating point, it was suddenly discovered that the Duke of Wellington was present. Instantly the manifestations of public admiration arose. Hats were taken off, and loud cheers burst forth, which were prolonged with immense energy. Those who were at a distance, surprised by an unwonted agitation which they could not understand, fancied that there was something wrong, and rushed towards the doors. The Duke also felt the awkwardness of his position, and beat a retreat. His great age does not now permit him to execute such movements with the precision and firmness which in former days were his characteristics, but he made his way nevertheless to the south entrance of the transept with surprising alacrity, followed as he went by the most vigorous demonstrations of popular regard. Superintendent Pearce, with great tact, stopped the rush towards the places of exit, and, by his judicious management, the fears of the most timid spectators were in a few minutes effectually quieted.

In commemoration of the exciting and wonderful scenes above imperfectly described, we give Four Illustrations: one of the appearance of the road at Hyde-park-corner; the second, of the crowd at the south entrance; the other two taken from two distinct parts of the interior of the Building.

DEMPSTER'S SEA TELEGRAPH.

TELEGRAPHING at sea, by means of flags and other description of signals communicating messages from one ship to another, and from shore to vessels and *vice versâ*, has long been considered a subject of much importance. Various methods have been projected, and improvements have been suggested upon those methods. There are now several telegraphs extant for signalising at sea, and books published to correspond with the arrangements of those telegraphs; but, for various reasons, none of them are sufficiently widely circulated amongst the shipping interest as the importance of the subject demands, for public security and convenience. It is rather a striking and remarkable fact, that amongst the many thousands of fishing vessels and coasters that are constantly navigating along our coasts, scarcely any of their commanders avail themselves of the advantage of a systematic mode of communicating their desires and wishes from one point to another. This may in a great measure be attributed to the want of a simple and easily worked code of signals. To obviate this want Mr. Dempster, who has long advocated fishery improvements, has concocted a series of signals, which deserve the attention of all persons interested in maritime affairs. The contrivance consists of a flag-staff, with an equilateral triangular signal, hoisted to mast-head. With this one signal, which is divided into four colours—red, white, blue, yellow, Mr. Dempster manages to symbolise fully the twenty-eight letters of the alphabet. The telegraph is exceedingly simple, and might be rendered very useful at sea, particularly during light winds and calms. The signal always shows its colours distinctly, put it in whatever position you choose. Under the old system the flags hang down during calms, and it is difficult to make their numbers out distinctly. Mr. Dempster gives a comprehensive idea of his system of signalising in a printed volume, which is appended to the flag-staff. There is also a large map, with the twenty-eight characters of the alphabet in colours, neatly executed. The base of Mr. Dempster's improvement on signalising at sea, chiefly rests on the principle of changing colours, by keeping one colour as a centre, until the other three work six [illegible] changes. Each of the four colours acting as a centre gives twenty-four different letters or numbers, and the four flags appearing separately give four more numbers, which make up the twenty eight letters.

HISTORY OF THE GREAT EXHIBITION OF 1851.

III.—GENERAL DESCRIPTION OF THE BUILDING.

THE building in its general arrangement resembles the distribution of parts in a cruciform cathedral with double aisles, consisting of a vast nave 72 feet wide, 64 feet high, running from east to west, 1848 feet in length. This nave is crossed at right angles near the centre of its length by a transept of the same width, and 408 feet long. The roof of this transept is semicylindrical, the curve commencing at a height of 68 feet. On each side, both of the nave and transept, run aisles 24 feet in width, and 64 in height, with galleries covering the whole width of the aisles at a height of 24 feet from the ground. Beyond these first aisles, and parallel with them, at a distance of 48 feet, are second aisles of similar width, and similarly covered for their whole width with galleries on the same level as those over the first aisles. In order to communicate from one gallery to another, bridges at frequent intervals span the 48-feet avenues, and divide them into courts, each of which has been so arranged as to present an ensemble to the eye of the spectator looking down upon it from the galleries. The avenues of 48 feet, which we have described as thus subdivided, and the second aisles, are roofed over at a height of 44 feet from the ground. The remaining portion of the building consists of one story only 24 feet high: in which there are of course no galleries. Ten double staircases, each 8 feet wide, give access to the galleries.

The total area of the ground floor is 772,784 square feet, and that of the galleries 217,100 square feet. The galleries extend nearly a mile in length. The total cubic contents of the building are about 33,000,000 feet. There are nearly 2,300 cast-iron girders, 23 feet 4 inches long, and 3 feet deep; and 358 wrought-iron trusses for supporting the galleries and roof; 30 miles of gutters for carrying the roof-water to the columns which support the roof, and 202 miles of sash-bars.

Commodious refreshment rooms, &c., have been provided around the trees at the northern extremity of the transept, and adjoining open courts towards the eastern and western extremities of the building, where the presence of the groups of trees dictated their location. The offices of the Executive Committee adjoin the southern entrance. In addition to the southern or principal entrance, there are two others, one at the east and the other at the west end of the building. Fifteen exit doors permit visitors to leave the building.

Water is supplied in abundance by the Chelsea Water-works Company, not only to guard against contingencies by fire, but to supply the numerous fountains which are distributed about the building.

Ventilation is effected and regulated by means of "louvres" consisting of metal blades fixed in wooden frames. These louvres resemble Venetian blinds in their action. An area of not less than 50,000 feet, superficial, of ventilating surface is thus distributed generally over the building. An ingenious arrangement of cranks, &c., so connects these louvres one with another, that a single man can open or close with great ease no less than 600 feet, superficial, by one motion of the arm.

The decoration of the building, which is in white and blue stripes, relieved with red, was designed by Owen Jones, Esq.

To give an idea of the enormous extent of the building, it may be noticed that the width of the main avenue is within ten feet double that of Saint Paul's Cathedral, whilst its length is more than four times as great. The walls of St. Paul's are fourteen feet thick, those of the "Crystal Palace" only eight inches. St. Paul's occupied 35 years in building, whilst the Hyde Park building occupied less than half that number of weeks; the celerity of the construction has been most remarkable. As many as 308 girders have been delivered on the ground in one week. Seven of the great trusses of the nave were raised in one day. Each man fixed about 200 superficial feet of glass per day. In order to perform these marvels, it was necessary to devise and employ various contrivances for economising labour, such as the sash-bar machine, the gutter machine, the morticing machine, the painting machine, the glazing machine, besides many others of an equally ingenious nature. The average number of workmen employed was about 1800, amongst whom about £2 500 was weekly paid in wages. Even in the payment of the workmen ingenious machinery was called into requisition, by which it was found possible to make nearly 2,000 distinct payments within the space of two hours!

With regard to the internal arrangements as they appeared during the period the Exhibition was open, a brief survey may be sufficient as a record for future reference.

Upon entering at the eastern end of the building, the productions of the United States were found arranged upon the north and south sides. Adjoining the United States on the north side, were the productions of Russia; Norway, Sweden and Denmark occupying the space opposite to Russia, upon the south side. Exhibitors from Northern Germany came next, on the north side to Russia, and upon the south to Denmark. The

productions of the Zollverein occupied a considerable space upon both sides, adjoining to those of Northern Germany. Articles contributed by Austrian exhibitors came next, also occupying a portion of each side of the central passage. The contributions from Holland joined, on the north side, the Austrian productions. Belgium next occupied a fair amount of space upon each side. France had 240 feet of frontage upon the north, and about 200 feet upon the south side. To Portugal and Spain were allotted a space upon the north side, as well as to Italy. Switzerland exhibited her productions upon the south side, and by their side were arranged the articles sent from Brazil and Mexico. Egypt and Greece occupied a space upon the north side, near to the transept, and in immediate proximity to some of the rich productions of Turkey, which stood at the point of junction with the transept. China had a frontage upon the south side, and a portion of that of the transept. Persia and Arabia adjoined to Greece and Turkey, in the north transept; whilst Tunis occupied a portion of the south transept.

Crossing the transept westward, the visitor found himself amid the productions of British India, Ceylon, and the rest of our colonies, from which he passed to the productions of the United Kingdom, arranged in various ways, according to their classes; the productions of Ireland being near the extreme west of the nave. The machinery in motion occupied the north-western part of the building; the steam-engine, of upwards of 100-horse power, being outside the building. The galleries were allotted to the respective countries in almost the same proportions as the space upon the ground floor. All the lighter and more elegant articles, including the plate and jewellery of the British contributors, were displayed in the galleries, the heavier articles being of course exhibited upon the ground floor. Sculpture and the fine arts occupied a position south of the west transept. Articles of statuary and sculpture were also placed upon each side of the central passage, small fountains and other ornamental works being placed in the centre. At the centre of the intersection of the transept and nave, or central passage, was the very beautiful glass fountain by Messrs. Osler, of which we have already given an engraving and description.

The general aspect of the building, externally, was thus described by the *Times*, about the time of its completion:—The eye, accustomed to the solid heavy details of stone and lime, or brick and mortar architecture, wanders along those extended and transparent aisles with their terraced outlines, almost distrusting its own conclusions on the reality of what it sees, for the whole looks like a splendid phantasm, which the heat of the noon-day sun would dissolve, or a gust of wind scatter into fragments, or a London fog utterly extinguish. There, however, the Palace of Industry remains, a monument of the extent to which lightness of structure can be combined with permanence and strength, a building remarkable not less for size than for the beauty of mathematical proportions and rectangular outlines. The varied dimensions and fantastic features of other edifices there find no parallel. Everything is done by the rule, and yet everything is graceful, and it might almost be said grand. Wherever one stands no disagreeable effects present themselves—nothing crooked, awkward, or out of place. The subordination of parts to the whole is complete, and an expression of order and exactitude reigns throughout, not unaptly typical of the progress which the mechanical sciences have made in this country. But for that progress this great building could never have been constructed, and it certainly is curious to reflect, now that the work has been accomplished, and the great result stands patent to the world, that with the facilities we possessed glass and iron have hitherto been so little employed by our architects.

Unfortunately, the south side, which is the principal façade, stands so close to the public thoroughfare that its proportions cannot be seen to advantage. Like many other great structures which will readily suggest themselves to the mind of the reader, the Palace of Industry must be viewed from a distance to be appreciated. Whoever would see a great mountain to perfection, must not survey it immediately from its base, and on exactly the same principle the new edifice in Hyde Park cannot be well viewed from the Kensington-road. The drive along the Serpentine and the bridge over it are the best points for a spectator to select. There the ground rises, and the vacant space enables the eye to reach over a large proportion of the building. The trees partly shut out the prospect, but enough remains to astonish and to captivate. The vast extent of area covered, the transparent and brilliant character of the structure, the regular and terraced elevations, the light airy abutments, the huge transept, with its arched and glittering roof shining above the great vitreous expanse around it, and reminding one of nothing that he has ever heard of before,—all these things are worth seeing, and threaten to interfere seriously with the selectness of Rotten Row. The drive along the Sepentine should certainly be made the main carriage approach to the Exhibition, for visitors, by a good view of the exterior, will have their minds prepared to appreciate the industrial wonders collected inside.

We have now made a comprehensive review of the Origin and History of the Great Industrial Exhibition of 1851, down to the selection of a site for the building devoted to its use; and we have also given a general description of the building as it now stands. The details of the ingenious machinery by which this stupendous and ever-memorable structure was completed in the incredibly short space of six-months, with illustrations, will form the subject of a distinct chapter.

In the meantime, pursuing the History of the Great Exhibition, rather than of the building of the Crystal Palace, we must speak of a matter very essentially bearing upon the ultimate objects of the undertaking, namely the prizes.

IV. The Prize Medal.

It was originally intended that large money prizes should be given: including one of 5,000*l.*, and one at least of 1,000*l.* to each of the four sections. Considerable division of opinion upon this subject was found to exist, and the prevalent opinion of the country seemed to coincide with that of Birmingham, at a meeting in which town it was resolved, "That it is not desirable to award money prizes to the successful competitors in the intended Exhibition, being of opinion that honorary distinction and commercial reputation are the most sure and honourable reward, and will prove the most generally satisfactory to the manufacturers of this district." The following are the final decisions upon this important subject:—

"Her Majesty's Commissioners have had under their consideration the subject of the prizes to be awarded to exhibitors, and have resolved to take immediate steps for having (three) medals struck of various sizes and different designs, it being their opinion that this is the form in which it will, generally speaking, be most desirable that the rewards should be distributed. They have decided to select bronze for the material in which the medals are to be executed, considering that metal to be better calculated than any other for the development of superior skill and ingenuity in the medalic art, and at the same time the most likely to constitute a lasting memorial of the Exhibition.

"With regard to the mode in which the prizes are to be awarded, the Commissioners think it inexpedient to establish beforehand rules so precise as to fetter the discretion of the juries upon which the task will ultimately devolve. It will be sufficient for the present to indicate the general principles to which it will probably be advisable to conform in the award of prizes for successful competition in the several departments of the Exhibition.

"In the department of Raw Materials and Produce, for instance, prizes will be awarded upon a consideration of the value and importance of the article, and the superior excellence of the particular specimens exhibited; and in the case of prepared materials coming under this head of the Exhibition, the juries will take into account the novelty and importance of the prepared product, and the superior skill and ingenuity manifested in the process of preparation.

"In the department of Machinery, the prizes will be given with reference to novelty in the invention, superiority in the execution, increased efficiency or increased economy, in the use of the article exhibited. The importance, in a social or other point of view, of the purposes to which the article is to be applied, will also be taken into consideration, as will also the amount of the difficulties overcome in bringing the invention to perfection.

"In the department of Manufactures, those articles will be rewarded which fulfil in the highest degree the conditions specified in the sectional list already published, viz.—Increased usefulness, such as permanency in dyes, improved forms and arrangements in articles of utility, &c. Superior quality, or superior skill in workmanship. New use of known materials. Use of new materials. New combinations of materials, as in metals and pottery. Beauty of design in form, or colour, or both, with reference to utility. Cheapness, relatively to excellence of production.

"In the department of Sculpture, Models, and the Plastic Art, the rewards will have reference to the beauty and originality of the specimens exhibited, to improvements in the processes of production, to the application of art to manufactures, and, in the case of models, to the interest attaching to the subject they represent.

"These general indications are sufficient to show that it is the wish of the Commissioners, as far as possible, to reward all articles in any department of the Exhibition which may appear to competent judges to possess any decided superiority, of whatever nature that superiority may be, in their own kind.

"In selecting the juries who are ultimately to guide them in making their award, the Commissioners will take the greatest pains to secure the services of men of known ability to form a judgment above the suspicion of either national or individual partiality (for which purpose they will be composed partly of English, and partly of foreigners); and who may be expected to recognise and appreciate merit wherever it may be found, and in whatever way it may show itself.

"No competitor for a prize in any section will be allowed to act upon a jury to award the prize in that section.

"The names of persons selected to act on these juries will be published when decided upon.

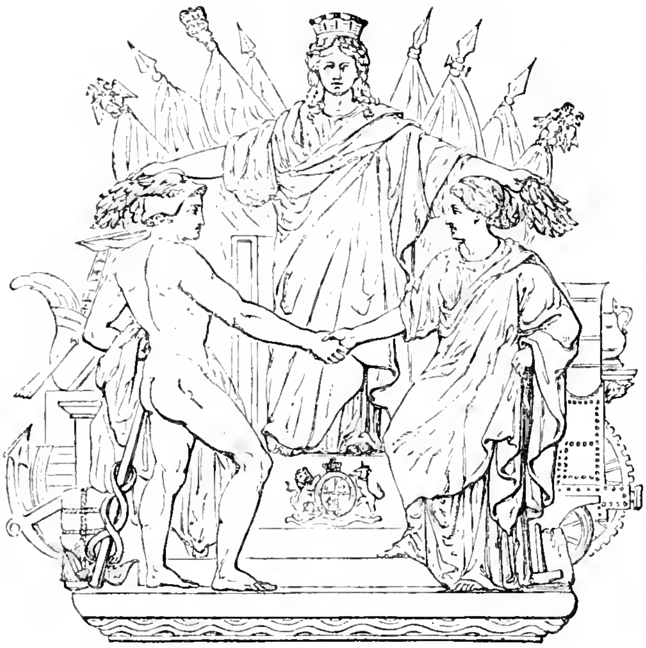
"All persons, whether being the designers or inventors, the manufacturers or the proprietors, of any articles, will be allowed to exhibit, and it will not be essential that they should state the character in which they do so. In awarding the prizes, however, it will be for the juries to consider, in each individual case, how far the various elements of merit should be recognised, and to decide whether the prizes should be handed to the exhibitor without previous inquiry as to the character in which he exhibits.

"Lastly, the Commissioners in announcing their intention of giving medal prizes, do not propose altogether to exclude pecuniary grants, either as prizes for successful competition, or as awards under special circumstances, accompanying, and in addition to, the honorary distinction of the medal. There may be cases in which, on account of the condition of life of the successful competitor (as, for instance, in the case of workmen), the grant of a sum of money may be the most appropriate reward of superior excellence; and there may be other cases of a special and exceptionable nature, in which, from a consideration of the expense incurred in the preparation or transmission of a particular article entitled to a prize, combined with a due regard to the condition and pecuniary circumstances of the party exhibiting, a special grant may with propriety be added to the honorary distinction. The Commissioners are not prepared, for the present at least, to establish any regulations on these heads. They consider it probable that a wide discretion must be left to the juries to be hereafter appointed in respect to the award of money

prizes, or the grant of money in aid of honorary distinctions; it being understood that such discretion is to be exercised under the superintendence and controul of the Commission."

An advertisement was issued on the 23rd of March, 1850, and extensively published in the English and Foreign journals, inviting the artists of all countries to compete for the designs for the reverses of three bronze medals, illustrative of the objects of the Exhibition, or appropriate as the reward of successful competition, and offering at the same time three prizes of 100*l.* each for the three designs for the reverses which might appear the most meritorious and the most suitable to the purposes of the Commissioners, and three prizes of 50*l.* each for the three best designs which were not accepted, the Commissioners reserving to themselves the right of making such arrangements for executing the successful designs as might appear to them to be the best. In consequence of this advertisement, one hundred and twenty-nine designs were sent in, and were publicly exhibited in the rooms of the Society of Arts. The Commissioners appointed the following gentlemen to act as a committee for selecting the best designs:—Lord Colborne, W. Dice, Esq., R.A., J. Gibson, Esq., R.A., M. Eugene Lami, C. Newton, Esq., of the British Museum, Herr J. D. Passavant, and Dr. Gustave Waagen, who, on the 29th of June, reported to the Commissioners that they had selected the following:—100*l.* each: Mons. Hippolyte Bonnardel, of Paris; Mr. Leonard C. Wyon, of London; Mr. G. G. Adams, of London. 50*l.* each: Mr. John Hancock, of London; Mons. L. Wiener, of Brussels; Mons. Gayrard, of Paris. We give engravings of the three medals accepted.

THE PRIZE MEDALS. £100 EACH.



No. 65.—Mons. Hippolyte Bonnardel.

M. Bonnardel's Medal shows Mercury holding a female figure by the hand (apparently intended to represent Industry, from the anvil, locomotive, &c., near her), in front of a figure of Britannia, standing on a slightly raised platform, with both hands extended, holding wreaths: flags of different nations make up the background. Motto: "Est etiam in magno quædam respublica mundo."

Mr. Wyon's Medal—Britannia, seated, is placing with one hand a laurel wreath on the head of an emblematical figure of Industry; and leading her forth with the right hand. Behind, are representations of the four quarters of the world, who have brought Industry to Britannia. To the right are emblems of the four sections:—1. The cotton plant and wheat-sheaf; 2. A wheel; 3. A bale of goods; 4. A vase. Motto—"Dissociata locis concordi pace ligavit."

Mr. G. G. Adams's Medal is a gracefully modelled group, in low relief, of Fame, Industry, and Commerce. Motto—"Artificis tacitæ quod meruere manus."

No. 24.—Mr. Leonard Wyon.

No. 105. Mr. G. G. Adams.

THE AMAZON, BY KISS OF BERLIN.

The Colossal Group of the Amazon attacked by a tigress, by Kiss of Berlin, is one of the marvels of the Great Exhibition, and has received more tributes of unqualified praise than perhaps any other single object in the Crystal Palace. It is certainly a very masterly production, and in a style which is almost new to sculptors of our day; though at the same time, from the nature of the subject, it is not entitled to rank with works in the highest class of sculpture. It is more animal than spiritual; the conception more startling than poetic. For the Amazon, it is a figure of tremendous energy. The manner in which she is represented, as having thrown herself back out of her ordinary seat, in order to get beyond the reach of the tiger, whose claws are already deep dug in the neck and flanks of the horse, whilst she takes deliberate aim for a single and critical blow at the head of the savage monster, is admirably conceived and carried out; the face with its mixed expression of terror and determination, is of itself a study sufficient for an entire work in sculpture. The horse and tiger are both masterpieces in their way, but unfortunately more than divide the interest with the human subject. This work is a copy in zinc, bronzed, from the original in bronze, erected in 1839, at the foot of the steps before the Museum at Berlin; having been made a present to the King of Prussia by a Society of Amateurs.

THE AMAZON, BY KISS

CARPET MANUFACTURE, BY HAND LABOUR AND BY MACHINERY.

CARPETS are comparatively a modern luxury in Europe, and especially in England. It was not until the seventeenth century was somewhat advanced that carpets were considered a necessary article of furniture by the wealthy: and it is within the recollection of the present generation that their presence in the cottage was considered a sure indication of comfortable prosperity on the part of their possessors. Up to a very recent period, floors of concrete were all that was felt to be necessary for the cottage: and the ground-floor of the farm-house could boast of no better material, whilst the fir or pine boards of the bed-room floor were rarely so close as to prevent a conversation between the occupants of an upper and lower chamber. The more wealthy occasionally indulged in the luxury of polished deal or oak, and sometimes added the attraction of parquetrie; but a carpet, if met with, was an imported article—the produce of Persia, the shores of the Levant, or Flanders. Persia still produces some carpets for the European market, and our Turkey carpets for the dining-room are still from the shores of the Levant; but France has for some years past supplanted Flanders in supplying our richer classes with those charming specimens of design and harmonising colouring which have for a long time justly placed the French manufacturer as the first and most tasteful of carpet producers. Persia and Turkey carpets are now what they always were in manufacture, and probably, in the majority of instances, in design also—abounding with strangely fantastic forms, luxuriantly and harmoniously coloured, and manufactured in materials second in durability only to the floor of which they form the cover. On this account we view the exhibition of these carpets in the Indian, Turkish, and Tunisian collections with much interest. Yet they evidence no progress; whilst those in the European, especially in the English portion of the Exhibition, show that the day is probably not far distant when the far north will supply the east with all that may be required of this class of goods, and when the manufacture—at least as at present conducted—will become as perfectly extinct as the manufacture of cottons for which India was once so renowned. For there exists, with respect to the manufacture of carpets in this country, the same careful study of the nature of the fabric—the same evidence of the successful application of mechanical contrivances to cheapen labour and reduce cost—the same steady progress and marked success in developing itself—which characterises the production of cottons of the present day, as compared with those of the hand-loom weaver of the early part of the present century.

It may somewhat surprise many of our readers when we say that there are but few *kinds* of carpet, and that the *mode of operation* pursued by the different manufacturers of carpets bearing very dissimilar names is precisely similar—that Tapestry and Tournay, Axminster and Wilton, are names that are given at the caprice of the maker, and, in many instances neither indicate the locality of the manufacture nor the quality of the carpet. In fact, one of these places, Axminster, has long ceased to manufacture the luxurious productions bearing its name. Tapestry carpets are those produced by the needle—they are, in fact, needle-work carpets, in which machinery has very limited duties to perform, and those of a simple character. Tournay and Axminster carpets are produced by hand also; a machine—if such it may be called—which is nothing more than a frame such as ladies use for stretching their canvass for needle-work, is set up perpendicularly, and the women occupied in the production are seated in front, and work horizontally. Each thread is knotted to the foundation or back, and is not in any other way connected with any other thread, and this is the distinguishing characteristic of the manufacture. There are no continuous threads, as in Turkey and Tapestry carpets—no weaving process of any kind whatever—no mechanical appliances worthy of particular mention. The process is unquestionably exceedingly primitive, though the production is often resplendent with the most marvellous beauties both in design and colour. "Velvet-pile" carpets, "Royal pile," and "Saxony," are all the *same kind* of carpet—the names being given at the caprice of the manufacturer, and conveying no definite idea of quality. They are each and all manufactured in the same loom, and are in different degrees the same fabric, and often the same pattern, as Brussels carpet. In fact, the *worsted loop* is the distinguishing characteristic of the Brussels carpet. When cut open by an old razor—the tool generally used by the weaver for the purpose—passing across the carpet, and guided in its course by a grooved wire over which the loop has been formed, it becomes a "Saxony." A wire of larger dimensions produces a larger loop, and this, laid open by the same primitive process, produces a "Velvet-pile."

Here, again, we may notice that names are capricious. Brussels has long since ceased to supply us with carpets, and carefully guards against our produce by prohibitory duties: else the Kidderminster manufacturer would supply Brussels carpets to the city bearing their name. Again Kidderminster no longer makes the carpet that bears the name of that borough, and we depend on the north of England or the west of Scotland for that production—the Kidderminster makers having directed their attention to the higher qualities of carpet manufacture.

No portion of the Exhibition offers more pleasing proof of the fact that as manufacturers of luxuriant products we are moving forward than that of carpets. Not only are the designs of many very superior in conception—showing that a knowledge of forms and colours is well understood—but the presence of some of the finest qualities of Axminster and Wilton encourage the hope that the highest descriptions of carpet manufacture, such as those of Aubusson and even of the Gobelins, will ere long be supplied by British manufacturers. Among this class of articles exhibited, we notice an Axminster, exhibited by her Majesty, manufactured at Glasgow for Messrs. Doubiggin and Co., from a design by M. Gruner. There is much in this that indicates the artist, but we cannot think that it will add to his reputation as a designer; the design is Italian, and the general form combines three parallelograms, a long one as a centre and a smaller one at each end, the longer sides of which extend the width of the carpet. The border is, in our opinion, stiff in delineation, being principally composed of geometric and architectural forms; the year 1851, expressed in Roman numerals, is in the centre, on a tablet of a white ground, surrounded by an oval band of flowers. A filling of damask pattern in crimson occupies the space between the border and centre.

M. Sallandrouze, the justly celebrated manufacturer of the Aubusson tapestries and the kerseymeres of France, has a fine display of these products, which worthily sustain his reputation. We think, however, that he has been unfortunate in the work which is evidently intended for the current year—a tapestry carpet of large dimensions, bearing the royal arms as a centre, and covered with devices of typical and emblematical character, each device being surrounded by a frame of French scroll ornaments. In the corners are representations of Europe, Asia, Africa, and America; in the border we find Poetry and Sculpture, Music and Painting, &c.; Commerce and Industry are on each side of the Royal arms, and in the intervening portions, Astronomy and Chemistry, Architecture and Agriculture. The names and the emblems of the principal seats of manufacture of Great Britain and France are also shown in panels. We have heard the fastidious object to flowers in carpets, but what shall be said of pictures? or who could reconcile himself to the notion of treading them underfoot!

Messrs. Jackson and Graham, No. 390, are the exhibitors of a "Tournay," or "Axminster," to which they have given the name of a "London Carpet." Why cannot manufacturers agree on an appropriate name for these hand-work carpets, and not continue to puzzle the public with a variety of merely local names for the same class of productions? This is a very superior specimen of fine Renaissance forms and drawings; the colouring also is unexceptionable, and would be warm and cheering by artificial light—a never-to-be-forgotten consideration in the manufacture of carpets for reception rooms.

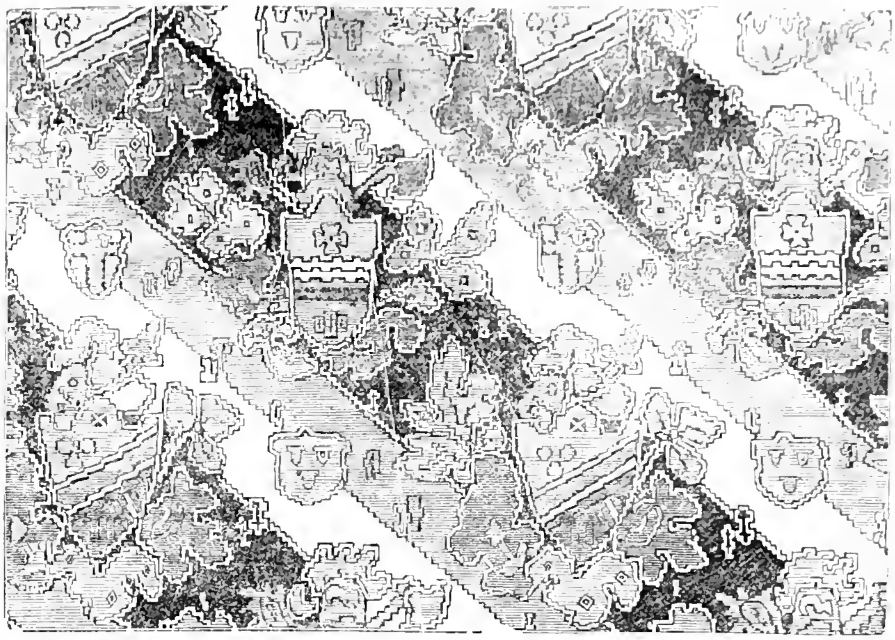
Messrs. Watson, Bell, and Co., also exhibit a hand-worked carpet—"Axminster"—of an arabesque pattern, with flowers united, correct in drawing and colour, and fitted to bear a close examination of detail. There is another carpet shown by this house to which we would direct special attention; the card attached to it notifies that it is the design of "James Crabb." The general character is arabesque; well drawn and varied coloured ornament forms the outer border and centre ornament of the carpet, and both these have orange-tinted, or what is usually denominated "salmon-coloured" grounds. The portion intervening between border and centre is filled with a well drawn small foliagenous ornament in citron colours, on a green ground; perhaps few of our manufacturers would have ventured on such a display of artistic colouring. The designer is "unknown to fame," but whoever he is, we commend him for the successful way in which he has dealt with colours which the manufacturer in general carefully avoids—which he will tell you "won't endure," and can never be combined with pleasing effect. We should be apprehensive of the effect by artificial light, but it is an excellent *daylight* carpet.

Messrs. Turberville, Smith, and Co., also show a carpet of peculiar pattern and colour, that will repay attentive observation: a dark ruby-coloured ground is covered by the leaves of the fern, glowing with all the tints that autumn gives to them, and forming an excellent pattern for a library or morning-room, with a warm southern aspect.

We now propose to notice the carpets produced by patented processes, premising by a few remarks upon the objects sought to be attained, and the relative value of these inventions. In the manufacture of Brussels carpet, about two-fifths of the worsted used is absorbed in the *back* of the carpets, and seven colours are the greatest number that can be introduced by the weaver; in consequence, the carpet is more costly than is necessary for wear—good material being absorbed in a part of the carpet never affected by use—and the designer is much shackled in his drawing by the limited number of colours or shades of colour that he is permitted to use. Mr. Whytock's patent was the first of importance applied to the manufacture of carpets. A thread drawn out of any printed cotton affords the best illustration that can be produced of the peculiarities of this beautiful and comparatively successful invention. A thread so drawn out will bear a certain quantity of each colour that is used in the portion of the pattern of which it formed a part; and it is manifest that, if the whole of a piece of printed cotton were separated into the threads of which it is composed—these threads re-arranged in the order in which they were originally placed—and the piece re-woven, leaving each in the same relative position that it originally occupied—the pattern would be reproduced in its integrity. Now, this is precisely what Mr. Whytock's patent accomplishes

in the manufacture of carpets. By his process, each individual thread is dyed with all the requisite colours, and in the precise quantities required for its position in the pattern, and this is done before the weaving commences. But this process requires a nicety of calculation, and is subject to casualties in the course of weaving, that unfit it for rapid production—that is, for being produced by the power-loom; and although no worsted passes into the back of the carpet, yet, from some cause or other, the price has not been affected, and the ordinary Brussels and velvet-pile carpets can, we believe, be bought at a price somewhat lower than those manufactured under this patent.

The next patent worthy of note is the one obtained and worked by Messrs. Templeton and Co., of Glasgow. It is only used for producing carpets of a superior quality, which are expected to find consumers amongst those who would otherwise be purchasers of Tapestry or Axminster. We deem it sufficient for our present purpose to say that, by Templeton's patent, *chenille* is dyed and woven in pattern, as worsted threads are dyed and woven in pattern by Whytock's patent. Many differences exist between the two, in the way of working, but the general result is as we have stated.



TAPESTRY PATTERN, BY BRIGHT AND CO.

The last and most important patent is that of Messrs. Bright and Co. By this process the carpet is woven in white worsted by power-looms; the wires used in the ordinary process are dispensed with, and the loop is formed by a peculiar arrangement in the machinery. The pattern is then printed on the carpet by a process that strikes the colours through the fabric, and, at the same time, prevents the possibility of their running into and mixing with each other. Thus a Brussels carpet is produced by a simple mode of operation, and by machinery that is admirably and ingeniously adapted for the purpose—effecting, as compared with the old method, a considerable saving in material, and leaving the designer perfectly free to indulge his taste or fancy to the utmost. We have already mentioned the fact that an old razor is the tool in general use for cutting the loop, and producing what is called velvet-pile. Messrs. Bright and Co. have accomplished the same effect by mechanism as beautifully simple as it is admirable in its adaptation for the purpose—for whilst the power-loom is producing the fabrics, it sets in motion a neatly-arranged instrument that cuts the loops, and thus perfects the plan and accomplishes all that the manufacturer could desire. We do not say that this process is perfected, or that all that is thus produced is so excellent as not to be distinguished from the best goods manufactured by the old loom and "draw-boys;" but we do think that it is highly probable that mechanical and chemical science will so far perfect it—will so combine in removing defects in machinery and difficulties in the production of clearly defined pattern and brilliancy of colours, as to lead to a vast change in the system of manufacture, and a consequent revolution in the interests of those engaged upon it.

Amongst the samples added to the Exhibition after it first opened, was one of a seven-frame Brussels carpet, "wrought on a new principle, by which the same results are obtained with half the worsted:" so it is described by the inventor, Mr. Fawcett, of Kidderminster; who adds that it was sent in too late to compete for the Exhibition prize, but that it has received the prize of 100 guineas offered by Mr. T. S. Lea, one of the jurors in this class, as a prize for "any new invention or improvement that would employ the working classes, and benefit the town of Kidderminster."

Still as the result of all the display in the Great Exhibition in this branch of manufacture it does not appear that any process has been made, or is as yet likely to be made, towards materially diminishing the cost of this article so essential to the comfort and decent appearance of our homes. Indeed it can hardly be expected, when it is considered how large a proportion of the price is made up of the cost of raw material, and how impossible it seems to be to economise upon the quantities used of the latter, without considerably diminishing the lasting qualities of the article produced.

It may be worthy of consideration, however, whether a suggestion thrown out, by a correspondent in the *Times*, as long ago as 1845, for the manufacture of cheap carpets from coarse cotton, might not be adopted with success. He states, "There are many kinds of carpets made of cotton in India—stout, serviceable, handsome [illegible], generally they are termed *serrique*. These are of all sizes, from the small 7 feet by 3 feet, which every man possesses, to enormous ones for rooms and halls. These are generally striped, red and blue and three shades of blue [illegible] woven into pattern; and I have often thought how useful they would be in England, [illegible] rooms &c. Again, such beautiful designs might not be manufactured by the skill of English workmen, how large a quantity of small ones for individuals, or large for halls, might not be sold for exportation to Africa, South America, and even India! At Warungul, in the Nizam's country, beautiful carpets of the same description as Turkey,—that is, with a nap raised,—are made of cotton."

Those who have carefully examined the varied contents of the East India department at the Great Exhibition will have found abundant and satisfactory evidence of the truth of the above remarks; a large assortment of "cotton carpets of different sizes" for Bengal and Saseeram, being a distinct entry in the catalogue, and a striking and interesting feature in the general display.

It remains to be seen whether our manufacturers at home can take up the same line of business with profit to themselves; and if they do, we are sure it will be conducive to the comfort of the public.

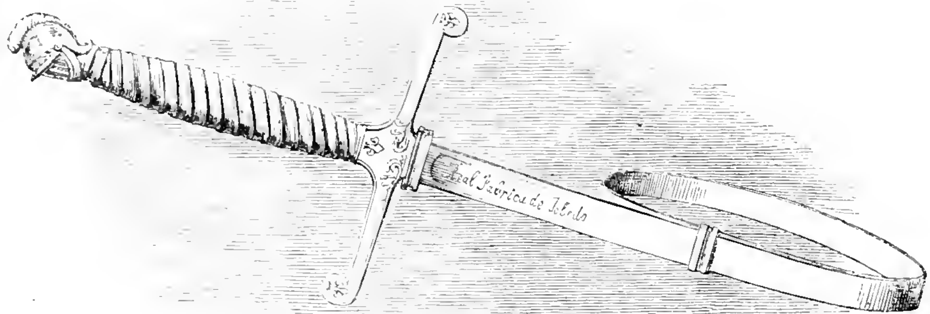
LECTURE ON ART MANUFACTURES.

ONE evening last week, Mr. Wornum delivered an interesting lecture at the Government School of Design, Somerset House, on some of the prominent art manufactures in the Exhibition. In his opening remarks the lecturer mentioned the different styles that were to be found there. There was the Greek style developed to some extent, the Oriental or Byzantine, a tolerable sprinkling of Cinquecento, a little Gothic as shown in the Mediæval Coyrt, some Elizabethan, and an immense quantity of Louis XIV. and Rococco. It was impossible to give more than a general view of the different styles. They were all very important to know, as it was the first business of every designer to make himself master of the different styles. The study of one style alone would be more fatal to his success than the absence of any; for in the former case his mind would be left free, but in the latter he became regularly stereotyped and marked everything with one style under all circumstances. After impressing on his hearers that natural forms might be used in design if attention was paid to a fit combination and use of them, he considered the question how far using the revival of past styles might be considered a servile following of mediæval art, and not sufficiently expressing the sentiments of the present age. In using the old styles they must be careful not to ignore the purposes their designs would be intended for in the present age. There might sometimes be injudicious revivals, but that which was naturally beautiful must remain so for all ages, and the revival of classical ornament was a good proof of the inherent beauty of those forms. It was perfectly legitimate to preserve beauty, but not to let it interfere with the uses for which it was designed. In the pottery department of the Exhibition he called attention to the difference shown in the articles exhibited by Messrs. Wedgwood and another house. Wedgwood's pottery was a revival of Greek taste, not slavish copies, but a classical taste adapted to the present requirement in those articles. In the other case they were merely Greek copies, perfectly ignoring present use. This was an example of the good and bad use of the past styles. Alderman Copeland, who exhibited in statuary porcelain with great success, also adopted the Greek style, and in that material had greater scope to display it. The Greek was the most important of the ancient styles, as it was the result of the labour of 800 years. The more modern nations had never had the opportunity to devote so much time to the elaboration of any of their styles. The Sevres china exhibited by the French was very beautiful, but from its costliness it was not so important to the many as the manufactures before mentioned. The display in bronze was, considering all things, but small, and the general style trifling. France and England were the principal exhibitors. The principal works of France were clocks and candelabra in the *renaissance* style, although there were other styles as well. The *renais-*

TOLEDO BLADE.

EXHIBITED BY M. DE YSASI.

THE temper and flexibility of the Toledo steel are well known as being unrivalled in the world, for the manufactory at Damascus is extinct. The singular looking weapon exhibited in our cut is a Toledo sword of extraordinary powers of endurance, as shown by its being thrust into a metallic scabbard twisted into a circle, like a serpent. When drawn out it is immediately as straight as an arrow, and gleams with formidable aspect in the sunlight. For an account of the manufacture of steel, see our article on "Iron, &c.," in No. 2.



TOLEDO BLADE, BY M. DE YSASI.

COLOUR-BOX.

BY MESSRS. ACKERMANN.

MESSRS. ACKERMANN exhibit in the Fine Arts Court a magnificent Colour-Box, in papier mâché, the decoration of which is very chaste and pleasing.

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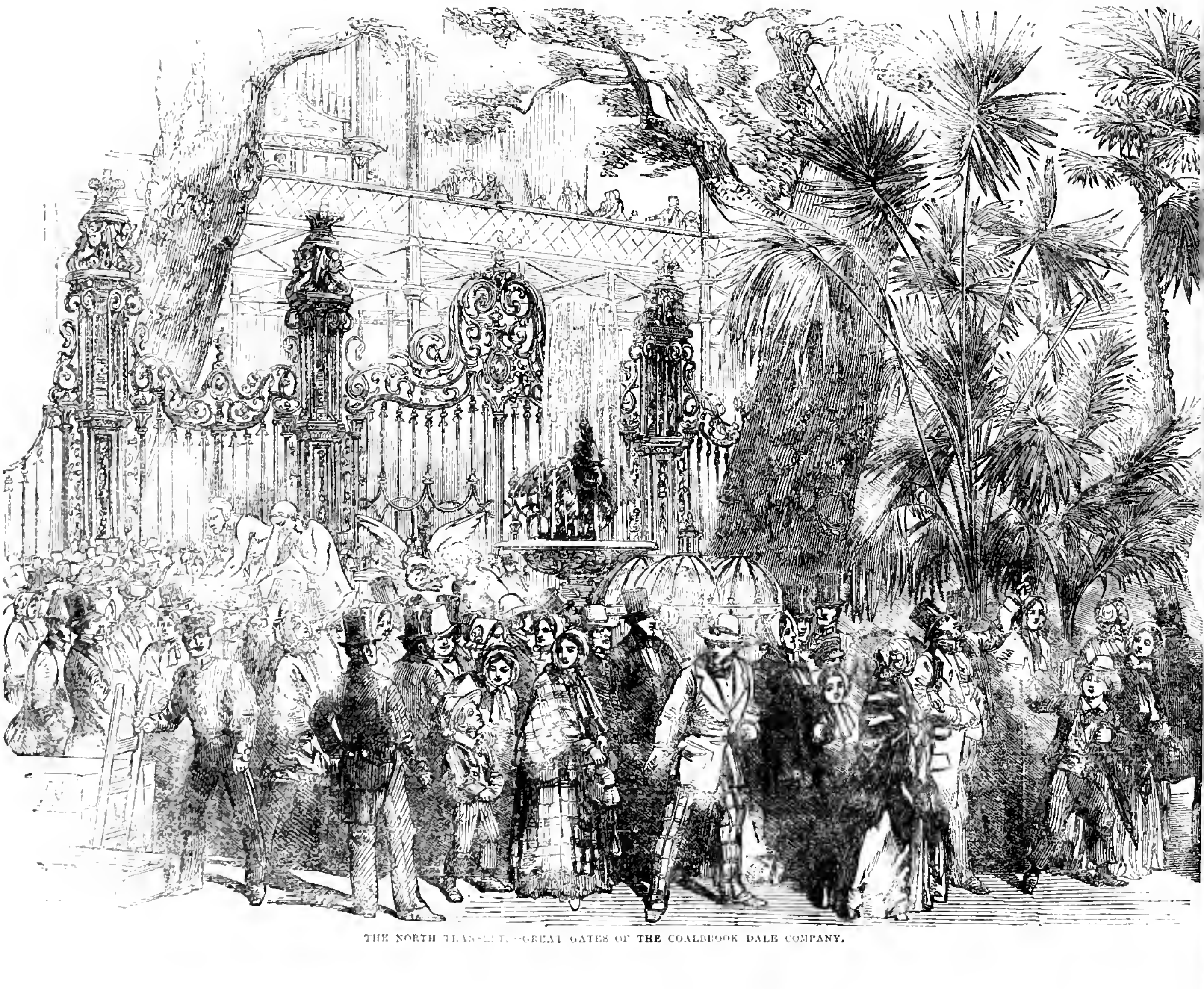
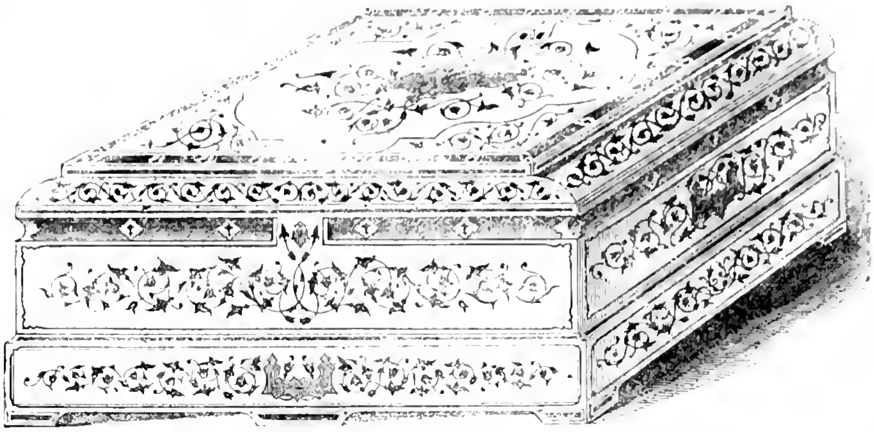
stace was much used by jewellers and goldsmiths, while the purer style, the Cinquecento, was principally used by painters, sculptors, and architects. The Damascened work from Liege was very fine. In hardware he regretted that a high tone of art was not applied to the cheaper articles in cast iron. In the silver work he pointed out the great advantage of oxydising the silver, or rather rubbing it with sulphur and ammonia. The effect of this was to make the silver of a more leaden hue, but at the same time the design was seen to much greater effect. Sometimes this was done to too great an extent; but it might be very slightly oxydised, so as to be hardly perceptible, and yet take off the dazzling glare which prevented the design being seen. He recommended this process more to the notice of the English. If they wished merely to exhibit their work for its value as a precious lump of silver, it was useless to make it look like lead, but if their object was to exhibit design, it must not have a bright and glaring



THE NORTH TRANSEPT.—GREAT GATES OF THE COALBROOK DALE COMPANY.

surface. He mentioned three specimens of oxydised silver in the English department—the group of Queen Elizabeth and Leicester, exhibited by Elkington and the Shakespeare shield and Titan vase by Messrs. Hunt and Roskell. In wood carving he awarded the palm to the French, although it was all in the *renaissance* style, and exemplified by a description of some of the English furniture the faults to be found in an unhappy combination of ornament. In one case the artist had supported his sideboard by cornucopiæ for legs, but, not contented with that, had made a satyr's head peering out of the top of each horn support the slab; and a dolphin's head at the extremities form the lower support, so that there were heads at both ends. Again, he said, the strong parts of the ornament in the French work, although most elaborate, were so arranged that they protected the weaker parts and might be brushed all over with a hard broom without fear of breakage; but the English he should be afraid to touch with a feather broom, there were so many exposed delicate angles and corners. In shawl fabrics he thought the English did not employ sufficient colours, nor were they always well contrasted; but the principal reason of this was that, as they worked by machinery, the shuttle was thrown right across the web, and the colour consequently appeared all through the shawl whereas in the costly French specimens the weft was worked in by hand; and in the Indian shawls the whole was worked by hand, leaving it to the taste of the workman what colour should be used; also, that it was impossible to judge of the effects of a combination of colours when viewing them separately, and throwing the shuttle by machinery, the effect could not be judged of till the work was done. Of course in England they would not produce shawls by hand as in India, owing to the difference in wages, as in the latter country they could get workmen for a penny a day; but he thought if ladies would get over the prejudice that no one but the French could produce good things that the English could compete with them. For although people would give fifty or sixty guineas for a French shawl, they would not give more than twenty guineas for a Spitalfields one. Mr. Wornum described several other departments of art manufacture in silks, printed and woven fabrics, glass, gutta percha, and many others, and was listened to throughout his lecture with great attention.



COLOUR-BOX, BY [illegible]

SCENE IN THE INTERIOR OF THE GREAT EXHIBITION.

MUSICAL INSTRUMENTS.

PIANOFORTES.

AMONG the objects of interest and curiosity which form the contents of the Crystal Palace, a prominent place is held by Musical Instruments. Of these the pianoforte is the most important, whether we consider its capabilities (being almost an orchestra in itself), its adaptation to all purposes of musical representation, its universal use in every family as an indispensable requisite for amusement and instruction, or its consequence as a branch of manufacture, employing a large amount of capital and skilled labour. Fifty or sixty years back there were scarcely a dozen pianoforte-makers in England; there are at present between 200 or 300 in London alone, while there are makers in most of the capital towns in the United Kingdom. It is calculated that there are not less than 1500 pianofortes made every week in Great Britain and Ireland, employing, when trade is good, full 15,000 workmen of a superior class, and receiving wages accordingly. From these facts the great magnitude and importance of pianoforte-making as a department of our national industry are at once apparent.

It is curious to contemplate the transition from the old harpsichord, with its tinkling lute like tones, to the power and richness of the present grand pianoforte. To do this, we must refer to some of the old firms of eminence, such as Broadwood's, Kirkman's, &c., who were originally harpsichord makers. The harpsichord was the original model for the grand piano; the shape, the scale, the strings, sounding board, and keys were the same: the principal alteration was in the mechanism—in the adoption of percussion as the mode of putting the string in vibration, in preference to pulling it by means of a little piece of crow's quill inserted in a piece of wood, moved by the key. This alteration made, the progress of the instrument was very rapid. There is scarcely an eminent firm in the trade who have not contributed to its improvement. It is not, however, to any one house, but to the exertions of a number of individuals, each acting upon, and taking advantage of the labours of the other, that the present perfection of the instrument is due.

In this department the leading houses take the first rank, while the display by makers of less eminence is exceedingly creditable. The manufacturers seem as desirous of pleasing the eye as delighting the ear, and, accordingly, we notice some very beautiful instruments, in which the art of the carver, inlayer, and gilder is lavishly employed; but we miss any attempt to give a more elegant and uniform shape to the grand pianoforte, which is so much to be desired. Messrs. Broadwood exhibit four grand pianofortes (one in a magnificent case designed by Barry), in which the beauty of the wood and the excellence of the workmanship are conspicuous.

The house of Erard sends several splendid harps, and a number of pianofortes, among which we perceive a revival of the old method of attaching pedals to an instrument. This calls to our mind having seen, long ago, an instrument with an octave and a half of pedals, by Kirkman, belonging to the celebrated Bartleman, and which he considered a great curiosity. Messrs. Collard, among other instruments, send specimens of their square and cabinet pianos, for which they are so famous. But the greatest attraction in this department appears to be the miniature model grand of Messrs. Kirkman. The art and science of pianoforte-making seems to be concentrated in this little instrument; and were it not there to speak for itself, no one would believe it possible to produce such clear, full, and sparkling tones in so small a compass, while no difficulty seems to be avoided, having 6¾ octaves and all the modern improvements. We have had our attention directed to the new repetition mechanism introduced into the concert grand pianoforte exhibited by the same firm, which, while it is as effective as that patented by the late Mr. Erard, is of a totally different construction; and the tendency of those actions to get deranged and to become noisy is here removed, and with a perfect repetition the touch is as smooth and light as can be desired. Another improvement, also by Messrs. Kirkman, is the addition of metal bracings to their oblique pianofortes, and the introduction of drilled metal studs and the harmonic bar for the improvement of the upper notes, so often defective in this class of instruments.

In regard to the foreign pianofortes, we may safely say, without any undue assumption of national superiority, that they by no means rival the productions of English skill and industry. The Paris pianofortes, next to our own, are the best; and the best of them are those of Erard, also an English manufacturer. Good instruments, too, are made at Vienna, and largely supply the demand of Germany; but even in France and Germany, the pianofortes of the great English makers have not lost the pre-eminence they have so long enjoyed. The American instruments are merely copies of our own. The only original construction among those exhibited is a double pianoforte (in other words, two pianofortes), each with its own set of strings and key-board (the sounding-board being common to both), so placed that two performers can play together sitting opposite to each other, or four if two are at each key-board. There is some ingenuity in this, but its ability in a musical point of view is very limited.

In another article we shall make a few observations on the other species of instruments, especially organs, of which there are a considerable number.

FOREIGN AND COLONIAL DEPARTMENTS.

PRODUCTIONS OF ABORIGINAL STATES.

THE first, and perhaps the most powerful and lasting impression received by an attentive visitor at the Exhibition, when looking through its vast collection of articles from every region on earth, is this—that all men, differ as they may in other important points, more especially the uncivilised from the civilised, nevertheless obey at least one law in common: they all, without exception, but in very different degrees of intensity, *labour*. The judgment that man shall live by the sweat of his brow, is here exemplified to the full, although a consolatory experience also proves that the curse may largely bring out its own relief. The most careless glance, however, at the multitudinous display of the material results of all men's industry, establishes some striking distinction in quality among them, even whilst unity in the one respect of effort is recognised; and it cannot but be useful to examine the several masses of products in detail, in order to search out the causes of the obvious difference in their respective values.

The articles indicated in the title of this paper, for example—the productions of those who are commonly called Aborigines, or the less civilised races—are substantially the inferior fruits of human industry. Yet they illustrate the primitive elements out of which the most advanced nations have elaborated their gorgeous and graceful, their eminently useful productions. The most polished nations may in them trace their own perfection backward to its source.

Then, these Aboriginal productions suggest, in their rude aptitude of purpose, sometimes in their skilfulness, irresistible arguments to the more refined, to look with greater indulgence upon their struggling fellows, by whom such interesting productions are made. The highly civilised man, rendered by science familiar with the works of uncivilised people, will subdue his own prejudices in regard to their incapacity, and soon come practically to aid them to acquire the superior qualifications that shall rightfully place them on his level.

China and India have so much in common with us, in their manufactures, their arts, and their agriculture, and they have made so much progress already in many respects, that purely *Aboriginal* products are comparatively few in those countries, but both possess some worthy of notice. Ceylon and the Indian Archipelago have sent us more such; and Africa still more, from all its quarters—east, north, west, and south. Turkey, although still too resplendent in "barbaric gold," instead of cultivating the best taste, is fast assuming the great forms of our civilisation; and Russia will bring from its remoter tribes only anything of a purely Aboriginal character. North America, in its prodigious new wealth of products of art and industry, offers some scanty memorials of deep interest from its Aboriginal tribes. Central and South America could have presented most curious combinations of civilised and uncivilised manners as now existing, and have sent us remarkable means of comparing the civilisation that existed before the New World was revealed to Europe, with the improvement introduced by Christians at a frightful cost of human life. Both regions, distracted with civil discord, have contributed a little—very little; but one South American British colony, Guiana, has made a zealous response to the call from home.

A rapid survey of these poor treasures of the primitive man's ingenuity still in his own hands, will unquestionably tend to allay the melancholy feeling too prevalent among us, that numerous portions of our race should be doomed by Providence to perish at the approach of their more instructed brethren. Facts encourage a nobler and a wiser prospect. A capacity for a safer and better condition of life is clearly established by these productions of industry, exercised in every climate, within the burning tropic and at the pole, by Negro and by Esquimaux; by the gloomy American forests, and over the bare steppes of Tartary; by the half amphibious islander of the Pacific equally as by the Kaffir, to whom an iron-bound coast and unnavigable mountain streams refuse the use of the simplest boat—each, however, having his peculiar occupation. All this confirms the oft-repeated judgment, that "art is natural to man, and that the skill he acquires after many ages of practice, is only the improvement of a talent he possessed at the first. Destined to cultivate his own nature, and to mend his situation, man finds a continual subject of attention, of ingenuity, and of labour."—*Ferguson's Civil Society.*

The same satisfactory conclusion is supported by analogous materials in the Exhibition, and more abundant ones than the purely Aboriginal products. These are the contributions obtained for our daily use by the combined labours of civilised and Aboriginal men. They are the raw materials of commerce to an enormous amount in quantity and value; the dyes, the gums, the drugs, the oils, the seeds, the woods, the woven and textile plants, the leaves, the roots, the skins, the furs, the feathers, the shells, which promote so largely the comfort and adornment of social life. The several departments of each civilised nation in turn have received these contributions from the barbarian, and sometimes from the savage—the Aborigines—whom in return civilisation has not yet discovered a better way to manage than by almost incessant warfare.

It is a capital point, in considering these raw materials of the arts, to know how to obtain them in a *genuine* condition; and on this point it will be found that our interests as manufacturers and merchants, and consumers,

coincide happily with our duties as men. Exactly in proportion as the native collectors of nature's stores are well treated and well instructed in the best ways of civilisation, the more expert are they, and the more disposed to be vigilant and honest in their work.

British Guiana.—The survey of Aboriginal products in the Exhibition may be conveniently begun with British Guiana, as the collections from this colony are remarkably complete, and it is a country admirably described by Sir Robert H. Schomburgk, one of the most accomplished of modern travellers. It is a portion of South America on the Atlantic, in latitude 6 degrees north of the equator, and contains 48½ millions of acres of land. The staple produce is sugar, rum, and coffee, with some cotton. Other produce of less value are its plaintains, and various esculents, with timber and other articles approved by the experience of the Aborigines.

The chief food of the natives, the cassava bread, is to be seen here, which it is seriously proposed to export to England, as being superior to the potato in nutritious quality, and so much more abundant than any meal known, that a profit of £50 per acre may be gained by its culture. The graters used by the natives in preparing the cassava meal from the root are of the manufacture of particular tribes, famous for this business, as others are especially famous for the manufacture of hammocks—the materials probably in both cases being abundant in their countries, as Manchester owes its ancient celebrity to the streams and coals of its neighbourhood.

The cassava bread is made in an elastic tube, called the *metappée*, a very ingenious contrivance of the Indians, says Sir R. Schomburgk, to press the juice from the root, which is one of the most violent poisons before being pressed. After the root is scraped it is pressed in this tube plaited of the stems of the *calathea*. A pole in the tube is used as a powerful lever, and weighed down by two persons sitting on it. The juice escapes through the plaited work; and the dried meal is baked in a pan in a few minutes. A specimen of the machine, as well as of the bread, is in the Exhibition.

Another new article of food was also exhibited—the plaintain meal—which the Indians use; and our settlers calculate it may be made to produce a gross return of £112 per acre! Well may Europeans be surprised, as Humboldt says they are, upon arriving within the tropics, at seeing the small space of ground that keeps an Indian family.

The juice of the cow-tree, sometimes used as a substitute for *milk*, is perhaps more valuable as one of the numerous materials for India-rubber. The physic nut in common use by the natives is one of the hundred vegetable medicines of the American forests, well worth further study. There is also, a species of Jesuits' bark, of far greater importance, considering its dearness almost prohibits its proper application in our hospitals; and this, also, is well known by the Indians.

But the most valuable articles exhibited from Guiana are the woods originally made known to us by native experience. For ship-building, they are certainly superior to oak and teak; and the bright colours of the specimens strongly recommend them for furniture. In regard to ship-building, it is a curious fact, attested by Sir R. Schomburgk, that one tribe in particular, the Warrans, have been famous builders of canoes and corrials, the durability and speed of which far surpassed any boats from Europe. They made a class of launches, carrying from 50 to 70 men, celebrated in the last revolutionary wars. The timber they selected, the mora tree, is now acknowledged to be the very best for the purpose. Specimens are in the Exhibition.

A more primitive canoe is exhibited, also, made of the bark of a tree, quickly constructed, of extremely light draught, and portable. Its convenient use in this last respect carries us back to the days of our most primitive forefathers, when the wicker and skin boat, to be still seen on the Wye and in Ireland, was easily borne on the shoulders of the adventurous waterman when obstacles impeded his navigation, or he wished to suprise a neighbour at a distant stream.

In this collection, too, we observed the original *hammock*, which we have so extensively adopted at sea, and which in France is wisely used in crowded rooms, from which it can be removed by day to purify the air. It is interesting to know that the Indians make their hammocks of extraordinarily strong textile materials, new to us, and of excellent cotton. Nor is it less interesting to learn that the sugar of Guiana, of which many specimens are exhibited, has furnished the native people with one comfort from us which they appreciate. They now grow sugar for domestic use: and the cane they cultivate is universally of the kind introduced by us from the French. Cook found it in the South Seas. Bougainville carried it to Mauritius; and thence, by way of the French West India Islands, it has spread, within about seventy years, over the civilised and aboriginal Western World.

These Aborigines, then, can adopt our improvements. They possess, also, the elements of the potter's art, which usually denotes a decided advance from savage life. The mere savage is content with what nature has provided to put liquids in—a sea-shell, a gourd, a part of an egg. The Indian of Guiana manufactures his buck-pots of clay; a specimen of which is exhibited. In a new edition of Marryat's beautiful "History of Porcelain," the catalogue of such utensils, from those of Egypt to those of Peru, should be enriched from well-authenticated examples such as these among Aborigines.

In some instances the Aborigines are proved to have completely adopted our usages. From Nova Scotia samples of wheat grown by Indians are sent of the same respectable weight (64 lb. 11 oz. to the bushel) as our own farmers' wheat. The Sioux saddle and hunter's belt, wrought by an Indian maiden, sent by a citizen of the United States, is entitled to be accounted a work of "honest housewifery," quite as much as the carpet wrought for our gracious Queen by the 300 English women. So the New Zealand chief, Tao Nui, who sends his contributions through his London agent Mr. Gillman, surely has ceased to be an uncivilised man. The contributions are, however, thoroughly Aboriginal "specimens of New Zealand woods, gums, and bark, flax and flax manufacture." The same conclusions may be drawn in favour of the capacity of the North American Indian to adopt our usages, from the model of the house of the once wild Carib, the cannibal of Columbus, with every household convenience minutely represented. The easy chair, the wax taper, the neat table, the tinder box, the old man's modern bed, as well as the aboriginal hammock, various musical instruments, various cooking utensils, the sugar-pot, cassava-pot, the grind-stone, the neat mat, even the gravy-can and a hundred other articles are there, to show the profusion of comforts which civilisation produces. And yet this is the race, thus making progress under a little protection, to which we often refuse common justice, and then we wonder that they flee to the bush. This little Indian picture of civilised barbarism is a lesson that should be perpetuated by such a simple work being, by and by, deposited in the British Museum, after the Exhibition is broken up.

The models of Guiana native dwellings, also, are very interesting as furnishing, in the abundance of their domestic comforts, some guarantee for their permanence in one place, so that they have clearly arrived at a condition beyond that of nomadic life. Other South American *models* are exhibited; for instance, there is one of a native raft in the Brazil department, although none, as far as we could find, of the far more curious flying bridges which span the awful abysses of the mountains. Mexico and New Grenada, Chili and Peru, are no longer subject to civil disturbance so continually, whatever may be the case with Central America, but that their engineering wonders of that character, from very old times, might have been produced with advantage.

Western Africa offers articles so various in kind, so abundant, and so valuable in commerce, that, when compared with the barbarism of the people, they irresistibly compel the admission, that trade alone does not solve the problem how men are to be civilised. These Africans, in particular, are most active merchants; and they have one usage which should strongly recommend them, as it furnishes a proof of their respect for honest dealing. If a bale of goods is not found at its place of destination to answer the sample, it may be returned to the broker, who is bound to get compensation from the original seller for the purchaser. The specimens of cotton, both raw and manufactured, from this region, are numerous. The plant grows everywhere; and if our best sort shall be found worth substituting for the native varieties, the habits of the people are prepared for its adoption.

The pottery works are very various, although calabashes, or vegetable vessels, are common. Dyes and medicines are abundant: and it is to be noted with regret, that poisons are familiar to the natives for the worst purposes. One article of export collected by the rudest people of West Africa is of great value, and it has an interesting history. This is palm oil, the import of which has increased since the abolition of the slave-trade, from a small amount, to more than 20,000 tons a year, worth more than 600,000*l*. This new African trade in a legitimate commodity is interesting, as a proof of the correctness of judgment in one of the earlier friends of Negro emancipation, whose very name has been forgotten in the long catalogue of the friends of that cause. Mr. Thomas Bentley, of Liverpool, a predecessor of Sharp, and Clarkson, and Wilberforce, was sagacious enough to perceive, and bold enough to maintain, when a merchant in that slave-trading port, that some articles existed in Africa more suited to the conscience and commerce of Englishmen than Negroes. He told his fellow-townsmen that they should send their ships, not for slaves, but for *palm oil*: and now it is for Mr. Thomas Bentley's palm oil that the very fleets are sent, which, but for the efforts of such men as he, would still be groaning with human victims. This good man became the partisan of Wedgewood, in the famous potteries, to the beauty of which his excellent taste secured their most successful character.

From Western Africa have also been sent the small leathern bottles of dye for the eyelids, which along with other like usages have been cited to prove the assimilation of the Negroes with ancient Egypt. The real aboriginal products of both regions are well worth comparing together, in order to illustrate the question.

Egypt, Tunis, and Algiers.—But the superior condition of modern Egypt, in point of progress, has led its exhibitors to confine their contributions too much to the results of civilised industry. Indeed, not only Egypt, but Tunis and Algiers, to judge from products thence on this occasion, must be excepted from the class of barbarous states, more absolutely than it is to be feared is consistent with the real conditions of a large portion of their people. Their contributions are chiefly showy silks and woollens; but, as is betrayed in the case of some articles from Algiers, to which the prices are fixed, their dearness really detracts much from their value, paradoxical as this remark may seem. In truth, a barbarous method of manufacture renders cheapness impossible, without in the slightest degree improving quality. These examples show how indiscreet has been the refusal of the Commissioners to let prices be set to all the articles exhibited.

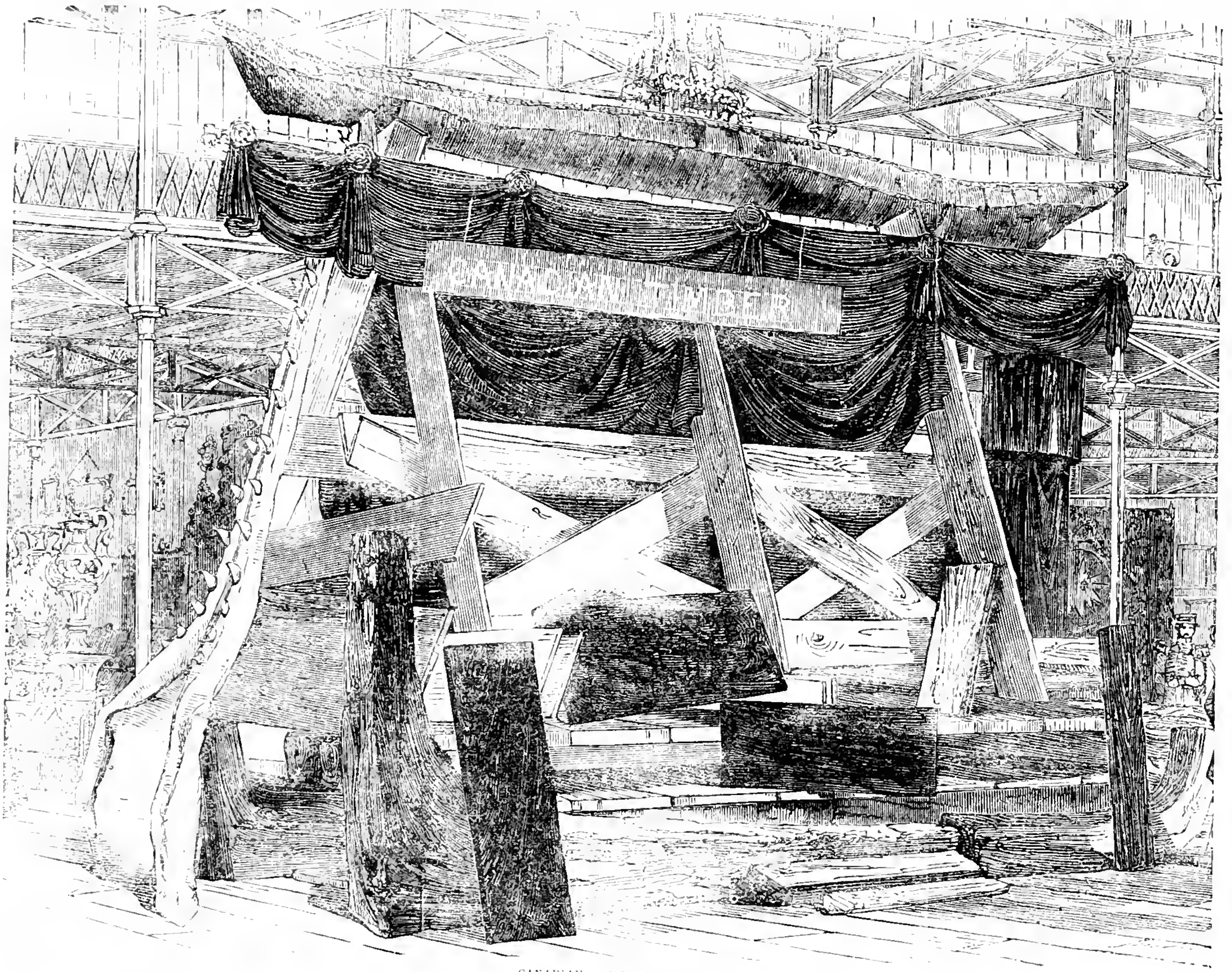
In one Tunisian article, barbarism, and the cause of its duration, are abundantly demonstrated. This is clear in the Arab's tent. Snug enough it is, and by its lowness easily sheltered from the wind, and even the sand-waves of the desert. Its camel's hair roof, too, is doubtless water-tight, but it marks the nomade man; and beyond all doubt the people whose

voluntary habit is to wander, is scarcely less incapable of intellectual and social culture than the more unhappy beings who, like the Indians of North America, are perpetually moved from home to home by the tyranny of their white invaders. It is probable that the principal cause of the unsubdued barbarism of our gipsies is their life of strolling.

The Cape of Good Hope has sent one article deserving special notice—the ivory of an elephant's trunk, of 163 lb., which must be a fine specimen. Ivory is chiefly bought of the natives; and, from Mr. Gordon Cumming's account of his own trading, its mystery may be interpreted to mean extraordinary hard dealing on our part. He had carried into the interior muskets, for twenty of which he had paid 16*l*., and obtained ivory in exchange at a profit of 3000 per cent., which, as he was informed by merchantmen, was "a very fair profit." To be sure, the manner in which the black chief, of whom he bought the ivory, had obtained it, by oppression inflicted on the Bushmen who killed the elephants, invites little consideration for that chief; but the whole story furnishes a fresh argument in favour of the civilisation which we consumers of this beautiful product of the desert are bound to use all means to substitute for its existing barbarism. The South African assortment of *karosses*, or cloaks made of the skins of wild animals skilfully dressed, ostrich feathers, and ivory, represent the Aboriginal produce, for which the Cape traders carry into the wilderness to the native tribes, beads of many colours and sizes, brass and copper wire, knives and hatchets, clothing, guns, ammunition, &c.

There is a melancholy tribute paid in the *Van Diemen's Land* department to its now extinct Aborigines. In our forty years' possession of that settlement we have utterly destroyed them, by as atrocious a series of oppressions as ever were perpetrated by the unscrupulous strong upon the defenceless feeble. Yet these poor people had tastes and industry too. Their bread appears to be worth reviving as a new truffle for soup by the gourmands of Hobart Town. The specimens of the root exhibited weighed 14 lbs. They obtained a brilliant shell necklace by soaking and rubbing off the cuticle, and gaining various tints by hot decoctions of herbs. They procured paint by burning iron ore, and reducing it to powder by grindstones. They converted sea-shells and sea-weeds into convenient water vessels; they wove baskets, and they constructed boats with safe catamarans. All these things are exhibited. Surely, then, the men whom their greedy supplanters admit to have done this, and whom the least possible pains ever bestowed on them proved to be capable of much more, ought not to have been hunted down, as we know they were, and then almost inveigled to be shut up in an island too small for even the few remaining.

The *New South Wales* contributions offer no sign of the Aborigine's works, and probably the country contains no longer any trace of the people; as Newfoundland contributors do not pretend to an interest in the works of the lost people who once inhabited it. *New Brunswick* seems to have nothing to show but the pretty models of an Indian family, the kindness of whose character is attested by having protected two maiden ladies, whose father emigrated from the United States after the Americans' war, and settled among the tribe some 70 years ago. The remnants of the Indians and the remains of the Royalists must have had many subjects of sympathy, and many feelings in common, to have maintained so long a career of mutual respect.



CANADIAN TIMBER TROPHY.

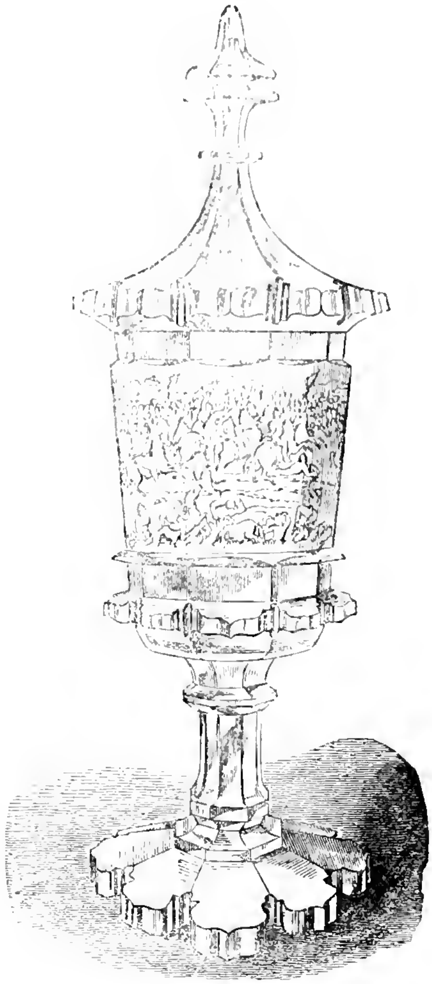
The whole amount of Aboriginal articles exhibited is much smaller than it would certainly have been, but for circumstances deserving of notice. Of late years the political condition of the Aborigines connected with various civilised nations, has been a subject more than usually interesting to the public. The emancipation of our Negro slaves in 1834 having in a great measure settled that question, the attention of philanthropists was free to be directed to the persecutions suffered by the Aborigines of our colonies. This was an extensive inquiry, and some reforms took place. Then a reaction occurred; until at length the old law of force and oppression extensively recovered its influence. In this state of things the Exhibition was planned, upon the principle of an universal invitation of the nations of the earth to bring specimens of their industry and art under a common inspection. The Commissioners made no exceptions; but it was

impossible that they should grant a privilege, or any special advantage, even to the least favoured in actual condition. The collection of articles to be exhibited was necessarily left to the cost and activity of the contributors and their various supporters. France was to take care of her people, Germany of hers, America of hers. The peculiar claims of the less advanced Aborigines for aid were discussed; but all that could be done was carefully to make known in various quarters that the Exhibition would be open to them. The result has been, that the same circumstances which render them inferior to civilised men in accumulated property and in acquired knowledge, have operated to leave their show of industrial development in the Exhibition somewhat meagre, whatever equality of capacity may be conceded to them, and however acute their natural intelligence.

THE CANADIAN TIMBER TROPHY.

WE come now to speak of the Canadian timber trophy, and in connection with it, of the timber trade of this important colony.

The Ottawa or Grand River, which joins the St. Lawrence near Montreal, forms almost entirely the division of the Canadas, and is the great highway so far of the timber trade, which along its bank employs from eight to ten thousand men—an army waging perpetual war with the forests, and which, under the false impulse of our former high differential duties in favour of Canadian timber, carried on its operations most wastefully and unfavourably for the character of the timber and the advance of the trade. Hitherto, white and red pine have formed the chief timber exports of Canada, felled mainly within a short distance of the banks of the Ottawa, and floated in huge rafts down that river and the St. Lawrence, a distance of from 600 to 700 miles, to Quebec. A single raft of timber will not unfrequently have a surface of three acres. The trees are cut down in winter, lopped, squared, dragged by horses over the frozen snow, which forms a slide for them, to the water's edge. The rafts are formed upon the ice, on which, when the spring thaw sets in, the lumberers, as these forest-felling timber traders are called, float down to port, anchoring when they come within range at each rise of the tide, and again pursuing their voyage at its fall. A raft seems almost as if some land-slip, or island, huts and all, were sailing down the river; it has five or six houses upon it, and, when the wind sets fair, a range of broad thin boards serves for sails. Some of the white pine-trees yield planks five feet in breadth, and the largest red pine will give 18-inch square logs, as much as 40 feet long. Of the pine order is the hemlock, a ship's futtock of which is shown in the trophy, and which is said bears water well, and is of all woods in those regions the most everlasting for railway sleepers, piles, or for any other underground purpose. But a single tree of the kind, which stands on a little island in the river St. Maurice, is to be found in all Eastern Canada. The tree in close forests is drawn up frequently to more than 60 feet in height, but its best height is about 40 feet, and its diameter in such specimens is rather more than 2 feet. The specimen in the trophy was cut from a tree 15 feet in circumference and 60 feet high. Close by this hemlock is a thick plank of a beautifully-feathered and highly polished dark wood, cut for veneers, from the fork of a black walnut a timber extensively used in Canada for furniture, and some beautiful tables, sofas, chairs, beds, and a piano of which are in the compartments opposite, and to be sold at the close of the Exhibition. The tree from which this plank was obtained was an old giant of its kind, and, judged by its size and internal appearance, though sound as a bell, had probably spread up its evergreen leaves to the sun for more than a thousand years. It stood in the valley of the Nanticoke, in the township of Walpole; and in the winter of 1847, Mr. Fisher, having marked it for destruction, set up a shanty near it. Its circumference at the ground measured 37 feet, three up 28 feet, from which it tapered very little to 61 feet, where it branched into two trunks, 6 feet and 5 feet in diameter; from this part the veneer plank was sawn. The whole tree cut up into twenty three logs, and made in all more than 10,000 feet of timber. Three men were engaged a fortnight in felling and trimming this single tree. The walnut is a hard close-grained wood, and it deserves trial—as it is to be had in immense quantities all over Canada—whether it would not serve as well as mahogany for ship-building. It is exported to the United States, but has not as yet entered into the timber trade with England. Another furniture wood in the trophy is curled maple, in its wavy grain very like satin-wood, not much differing from it in colour, and growing as abundantly as the pine itself. It has also found its way to the United States largely, but in but small quantities to England, though it is a hard wood, and admirably adapted for furniture. A bird's-eye maple veneer is also shown. The first bird's-eye is from young trees, of from twelve to fourteen inches diameter. As they grow old and large the spotted curl dies out from the centre; the veneer in the trophy was, however, shaved off from a large old tree by a peculiar kind of cutting machine, which saws or shaves off the veneer in a spiral round the log, commencing at the outside, and stopping where the bird's-eye pattern ceases. There are, besides, two other sorts of maple shown, the plain hard maple used largely in house building, ordinary furniture, and in immense quantities for domestic firewood and steam-boats. In Montreal alone there are consumed in a single season



GLASS GOBLET, BY A. BOHM.

GLASS GOBLET.

THIS most exquisitely engraved goblet, though exhibited in the Hamburgh department, is the work of Augustus Bohm, of Meistordorf, in Bohemia, and owes its location to the circumstance of its talented fabricator residing at Hamburgh. The skill displayed in engraving the glass, so as to produce a perfect bas-relief, is most marvellous; and, when the numerous figures in action and horses (for the scene is a battle-field), are taken into consideration, an extreme length of time must necessarily have been spent in its realisation. The glass is pure flint, and colourless.

JEWELLED HAWK.

JEWELLED HAWK.

THE history of the Jewelled Hawk, the property of the Duke of Devonshire, in the Netherlands department, is not without interest. It rejoices in a name proper, being the "Knyphausen Hawk," and was made, many a long year ago, to commemorate the reconciliation of two noble Dutch families which had been long at variance. It contains within its gay plumage the identical gold drinking-cup which was used by the rival Counts upon the auspicious day of their reconciling, and which is discovered upon removing the head of the bird. The wings and body are chiefly covered with rubies; turquoises, emeralds, and other precious stones are displayed in other parts. The bird stands about a foot high, more or less, and has a very stately appearance.

from 2,000,000 to 3,000,000 cords of firewood—a cord of wood being a bundle eight feet long, four feet high, and four feet broad, and costing thirteen shillings English money. Each family on an average uses about six cords in a season. The soft maple is but rarely cut down, as it supplies sugar abundantly. In spring, before the snow has left the ground, when the sun begins to gain strength, and there is still a sharp morning frost, the farmer bores, about four or five feet up the trunk, a hole some two or three inches deep, and sticks a little cane spout in it. In a few hours he has in his wooden trough below from two to three gallons of syrup; and every morning for a fortnight, as the sap rises with the sun, the tree pours its sweetness until twenty or thirty gallons are collected. In a spring without frosts, the supply of sugar fails, and its collection is a work of no small hardship. Its after preparation is a rude process: it is evaporated, to some extent, over a slow fire, and then poured out in pans to cool. The sugar maple grows from forty to fifty feet high, and about six feet in circumference. The other timbers in the Trophy are more generally known. The birch tree, a favourite town plantation, is used in common furniture, and the timber is largely exported to the States. The oak, both white and red, is exported as staves both to America and England, and so is the ash, of which Canada can furnish inexhaustible supplies. The bass-wood is new to us, but, it seems, has been proved so useful at home that it may be imported with advantage. It is a soft wood, but close-grained and durable, resembling something our willow, and has been found most excellent in doors, and the panelling of railway carriages. The rock elm is also a new import; it grows apparently from the bare rock to a height of 30 to 60 feet, and 18 to 20 inches in diameter, a tough, durable wood, and deserving trial for ship-building purposes; and the butternut, growing on fine dry land, and most of all a favourite, both in the States, and Canada, for veneering upon, as with ordinary seasoning it is never known to warp. Last on our list is a little log on the floor, with light edges and a dark centre, marked iron-wood, of no earthly use, said our native informant: "It won't float, it 's the contrariest wood in creation: if you want a straight piece, and half break your heart with hard work to get it, it will twist itself crooked in no time, and if you mark out a crooked piece, as sure as sunshine it will stretch out as straight as a line: it's as hard as iron and as heavy as lead, and as obstinate and cranky as an old mule, and never worth either letting grow or cutting down."

In conclusion, we have a word of advice, in view of this timber trophy, to give our Canadian friends: it is that they begin to build ships of their better woods. Their fir-built craft stand but four years A. 1. on Lloyd's list. They do right well to send a cargo of timber to England to help to pay their cost, but are not profitable afloat. We have to face the world now with our ships. Canada has no longer any advantage, and can only hold her place in ship-building, whether for sale or trade, by aiming to build as sea-worthy and durable vessels as the Northern and United States. Cheap run-up ships are the dearest in the end: try, therefore, your walnut, red oak, hemlock, and rock elm, and use the pine only where pine is best, and where first class vessels use it.

The total value of the export of timber from Canada in 1849 was 1,327,532*l.*, of which not less than 1,000,000*l.* worth came to England.

Rival American Reaping Machines.—Since our publication of an engraving, with description of M'Cormack's American Reaping-machine (See No. 1), a trial has taken place, before the Cleveland Agricultural Society, of the respective merits of that machine, and one invented by Mr. Hussey, also an American, and the report of the jury of practical men appointed by the consent of both parties to decide the question of merit is favourable to the latter implement. This decision throws considerable doubt upon the justice of the award of a great medal at the Exhibition to M'Cormack's: but, however interesting the matter may be to the individuals themselves, it does not much affect our farmers. Both the reaping machines, valuable as they are, are capable of great improvement, and we confidently hope that before next harvest comes round such changes may be made upon them, and such new features introduced, as may render the examples now exhibited comparatively unimportant.

Government Purchases in the Crystal Palace.—We understand that the Board of Trade, with a view to the development of a pure style in the Government Schools of Design, has commissioned Mr. Redgrave, Mr. Cole, Mr. Owen Jones, and Mr. Pugin to make a report of those objects in the Exhibition which they would recommend for purchase, as models of taste. The selection of persons made by the Board of Trade for the purpose in view seems most judicious, and we have every confidence that their report, if acted upon, will secure to our schools of design that of which at present they stand so much in need, a collection of specimens by which the principles of art manufacture may be best illustrated.—*Times.*

On Wednesday the Exhibition was visited by thirty boys and twenty girls, belonging to the Ragged School, Pye Street, Westminster, who obtained admission by subscription from the benevolent, sent in consequence of an advertisement inserted in one of the morning newspapers. There were in also on the same day eighteen old people from Bletchingley, Surrey, whose expenses were defrayed by the rector, and other gentlemen of the parish, and whose joint ages amounted to 1,111 years.

PHILOSOPHICAL INSTRUMENTS AND PREPARATIONS.

THE MICROSCOPE AND MICROSCOPIC PREPARATIONS.

The use of the microscope has, within the last few years, completely revolutionised the study of physiology in this country, and microscopic objects naturally demand full consideration. In this particular, Mr. Hett has greatly excelled. He has devised a very excellent plan for showing a number of injected specimens under a microscope, showing the formations of various animal bodies, even to the manner in which the blood comes in contact with the atmosphere in the lungs, and becomes arterialised. At the College of Surgeons of London we have the finest anatomical and physiological museum in the world; and the Exhibition, by bringing forth Mr. Hett's instrument, has shown how Mr. Queckett's preparations may be rendered available to the student at any time. With microscopical investigators Mr. Topping has a great reputation. He exhibits five frames containing the test objects which are suitable for the best microscopes, together with fossil earths and fossil and recent vegetable structures. He has also shown some beautiful specimens of dissections of insects, and specimens of bone, teeth, and shell, and even sections of Oriental and Scotch pearls. Beside these, he also exhibits anatomical injections, including a remarkably fine example from the intestine of the rhinoceros. All these specimens are entitled to the highest commendation. Within the last two or three years a second mounter of microscopic preparations has appeared in the person of Mr. Poulton, of Reading, who has exhibited a case of first-class objects which he has prepared.

Mr. Stark, of Edinburgh, exhibits a process of mounting objects in gutta percha cells, but we have not yet been able to try it. Messrs. Smith and Beck exhibit a model cabinet, well adapted for containing the objects; but we are afraid it is almost too aristocratic for the working philosopher, to whom expense is an object; and, lastly, Mr. Leonard exhibits drawings of microscopical objects.

The ordinary mode of injecting the capillary vessels is either by size and vermilion, or by the chromate of lead. In examining the objects, we detected, however, unlabelled, one specimen of a carmine injection, which was manifestly a section of brain. Mr. Smee has exhibited at various *soirées*, as well as at the Microscopical Club, a series of specimens of this character. The microscopic specimens which are here exhibited may be taken as a fair example of the minute knowledge which is now possessed by every well-educated medical man at the present time. Scarce fifteen years ago, no Englishman was conversant with the gorgeous structure which the microscope reveals in a piece of dry bone. Since that period the mode of arrangement of the ultimate blood-vessels of every part of the body has been determined. The geologists now delight in the examination of fossil infusoria, or in sections of the teeth of the gigantic tenants of a former world. The chemist now examines his precipitates, and has ocular demonstration of the characters of the substances which he examines. The entomologist determines the genus by the form of the scales which cover the butterfly's wing; and no investigator, in any branch of science, is satisfied without the possession of a microscope to assist his powers of vision. The microscope is, to minute objects, what the telescope is to the starry firmament, and both must exemplify how limited are the powers of man, to grapple with either the minutiæ or infinite extension of Nature's works.

IBBETSON'S CASTINGS.

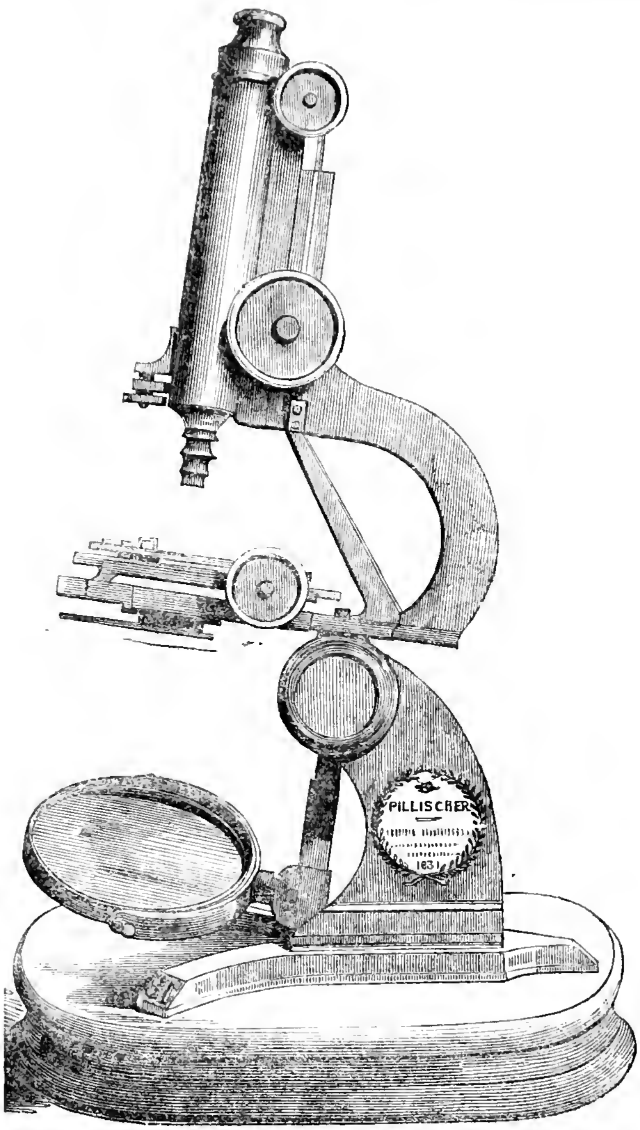
In a glass case, in an obscure passage near the entrance to the machinery in motion, we observed some specimens of casting by Capt. Ibbetson, which are entitled to consideration, from their novelty and beauty, and their applicability to manufacturing purposes. The first of these comprises castings in brass from works of nature, and in this way Capt. Ibbetson has contrived to render the leaf, with all its detail, in a manner which has not heretofore been accomplished. Chantrey some years ago had a high appreciation of casting from nature, and he devised means by which the object was encased in clay, baked, and then the powdered part driven out by means of a current of air; but he could only take one cast from a mould, while Capt. Ibbetson states that he can make any number of copies. He exhibits, also, a casting, of brass, of a raised map of the Isle of Wight, which may be useful for educational purposes. This model, although upon a small scale, is made from his own surveys, which he also represented in the wonderful geological model in the Western Nave. The second kind of casting consists of deposits of an alloy of gold and copper by electrical agency. Now, electro-metallurgists state that these depositions are in the highest degree difficult, because the current will reduce that metal which requires least force, to the exclusion of the rest. Capt. Ibbetson states that his specimens have been analysed, and they are found to consist of an equivalent of each metal, a fact of much interest to the chemist. By this plan he has covered the fairy-like maiden's hair fern, the pitch plant, the humming-bird, and many other curious species which he has procured from

the national gardens at Kew. The mode by which he obtains these results he at present keeps secret. The third invention consists in a new mode which he has discovered of bronzing iron. He states by his plan he contrives to throw the bronze, as it were, into the texture of the iron, and that it dispenses with the use of varnish or any other similar substance. The specimens exhibited are very beautiful, and it has been reported that the Coalbrook Dale Company are thinking of adopting the invention, which is also, for the present, kept secret.

The importance of these specimens is not so much to be found in their own merit as in the power which they afford to the manufacturer to extend processes in directions hitherto unknown.

PILLISCHER'S MICROSCOPE.

Mr. Pillischer, who is one of the best makers of microscopes in London, exhibits one of large dimensions, of exquisite workmanship, in order to show what can be done in his way. This beautiful instrument is the



MICROSCOPE, BY MR. PILLISCHER.

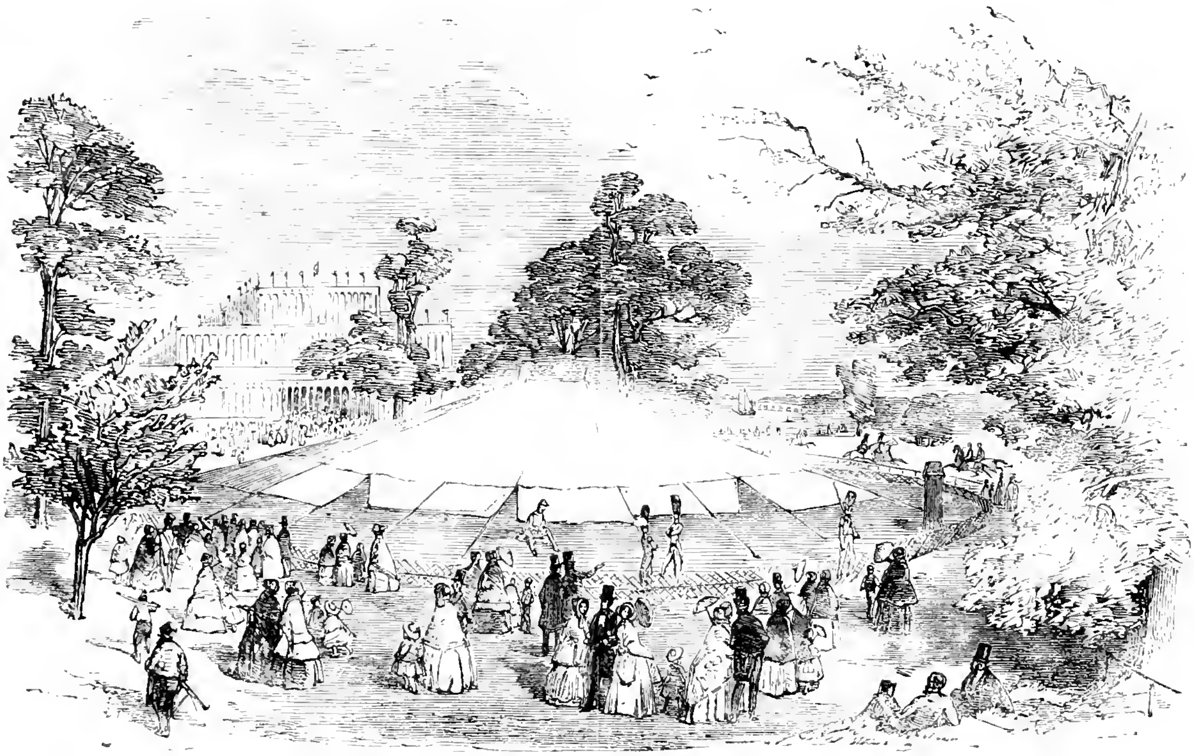
largest which appears in the building, and is of the most approved construction, being in every respect properly placed as regards its centre of gravity. The stage is much simplified in comparison with those ordinarily used, and is worked by means of a rack and pinion, and an Archimedian screw, the two pitches corresponding accurately with each other, giving $\frac{3}{8}$ths of an inch motion for each revolution. The fine adjustment works with a lever and screw, having 90 threads to the inch. The body slides on a groove, and can be adjusted by rack and pinion to the greatest nicety. As in the best microscopes, a draw-tube is fixed on the top of the body, to which the maker has added a very useful contrivance in the shape of a register, attached to one of the milled heads, whereby the nicest adjustment may be obtained, so that the examiner is enabled to look at the object under inspection, while he is increasing the power to any required degree. He has also added an *erecting* eye-piece to the body, which is also another advantage.

ANATOMICAL MODELS.

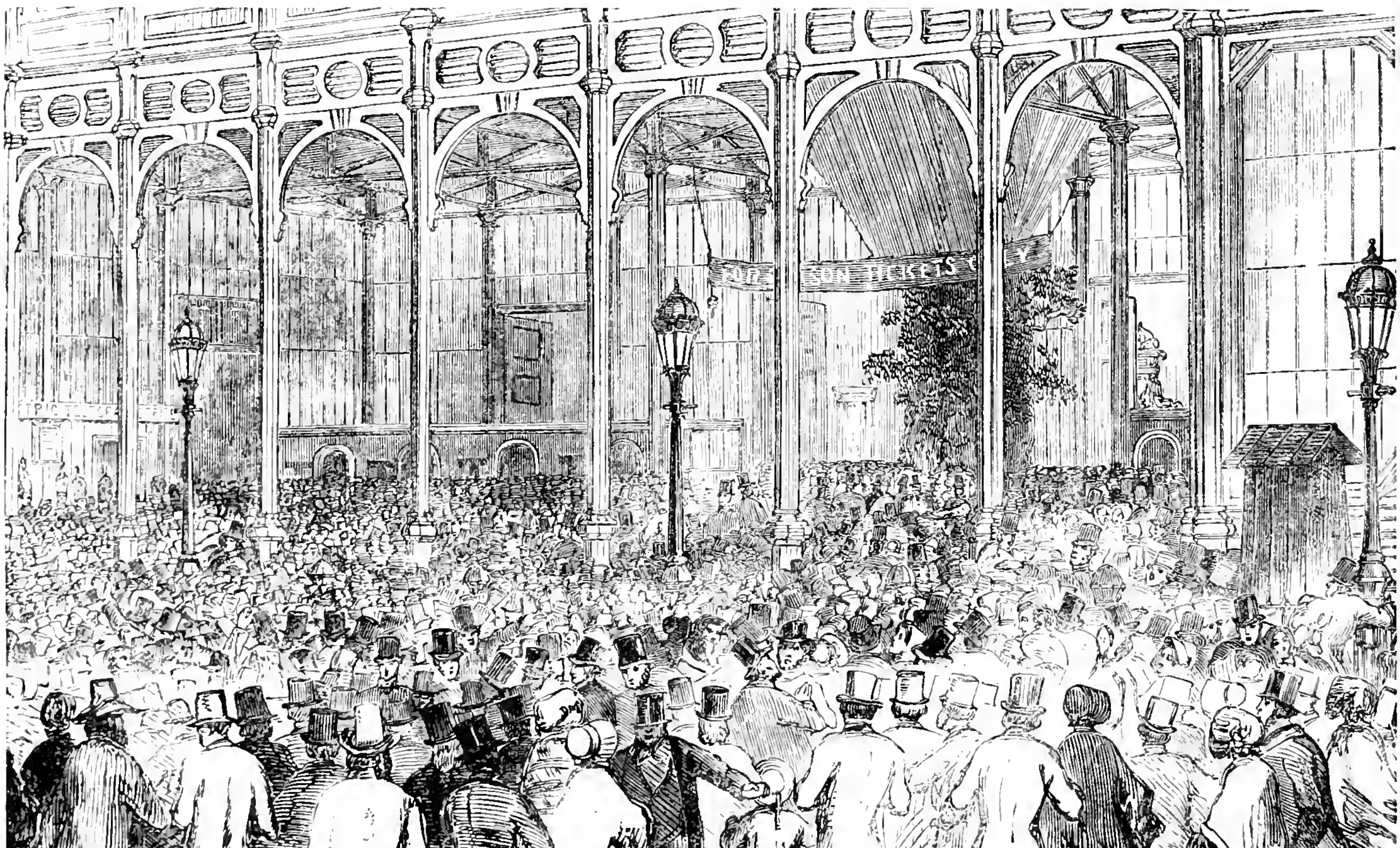
Grouped among the Surgical Instruments, in Section 10, are some contributions of anatomical models, a department of art which, from the extensive collections in Italy, France, and Germany has been supposed to be exclusively confined to the Continent, but in which some of the specimens exhibited on the British side will show that we have advanced to a high degree of perfection in this country. The materials of which the models are principally composed are plaster of Paris painted, *papier mâché*, gutta percha, and wax; and the subjects which they illustrate are dissections of the human body, some few morbid specimens, and the anatomy and development of several of the lower animals. With the exception of an interesting series of anatomy of the male and female torpedo in wax, presented by the Grand Duke of Tuscany to Professor Owen, and deposited by him in the College of Surgeons, we have not recognised any striking display of talent on the Continental side. The magnified models of gutta percha, &c., which take to pieces and show in successive layers the deeper parts in the organisms they demonstrate, however ingenious and amusing they may be, have no pretensions to a high, and far less the highest, order of anatomical modelling. The French exhibit a variety of these; and a full-length anatomical figure in *papier mâché* and gutta percha, with a section of the human head, is shown by Mr. Simpson. Our attention, however, has been arrested by some very striking wax models, by Mr. Towne, whose experience and skill are well known from his works at Guy's Hospital. He appears to have selected some of the most intricate and difficult dissections, and to display the several structures with a rigid regard to truth, which challenges the severest scrutiny of the practised anatomist. This is obviously the case in a model of the head and neck, with a deep section of the brain, in which there is not only a most valuable piece of anatomy in the relative position of the muscles, blood vessels, and nerves of the neck, and the distribution of the great nerve of sensation, known as the fifth nerve; but there is also a minute dissection of the internal ear and the orbit, which exceeds any that we have yet seen, in delicate, yet perfectly clear and accurate modelling. An arm at full length, with the corresponding side of the chest, exhibits the minute distribution of the nerves, with the arrangement of the muscles, blood-vessels, &c. A very beautiful and complete series of changes which takes place during incubation in the chick is also shown, and the same subject is illustrated by an exhibitor from Newcastle. The latter artist has tried to unite natural structure with his models, but with no more than the usual success of such incongruities. A case filled with some small models of the heads of the great divisions of the human family affords an interesting subject for examination, and a felicitous reference to the extent of race, which is included in the purposes of the Exhibition.

LACE GASSING MACHINES.

Mr. Samuel Hall, of Basford, near Nottingham, whose name is favourably known on account of his condensing apparatus and other inventions, originally took out a patent for a machine for gassing lace; and in order to show the importance of this invention, it is only necessary to state that the cost of burning off the fibres from muslin and other delicate fabrics, some thirty-five years ago was at the rate of 6d. per square yard, whereas at the present time as much as 600 square yards of lace may be gassed for the same sum. The gassing machine in the Machinery in Motion Department of the Great Exhibition, which is exhibited by Messrs. Barton and Eames, consists of a series of gas-burners, placed in a straight line, and regulated in length by the width of lace to be "gassed." The lace is made to pass through the various jets of gas at such a velocity as will just remove the fibres by which the whole surface is covered, and yet not destroy the fabric itself. It is quite evident, therefore, that the exact speed at which the lace is required to travel through the jets of gas must be regulated with great nicety; for if the velocity be too great, the object in view will not be attained. During the process of gassing the lace is carefully watched by four persons, two of whom stand in front, and two behind the machine, in order to see that the lace is duly gassed, and also to prevent the fabric itself taking fire. Cotton thread which has been subjected to a process somewhat similar to that above directed, by means of a machine somewhat modified from that above described, is sold in the market as "gassed thread," and in consequence commands a higher price.



ENCAMPMENT OF FOOT GUARDS, AT THE EASTERN END OF THE GREAT EXHIBITION BUILDING.



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The CRYSTAL PALACE AND ITS CONTENTS.

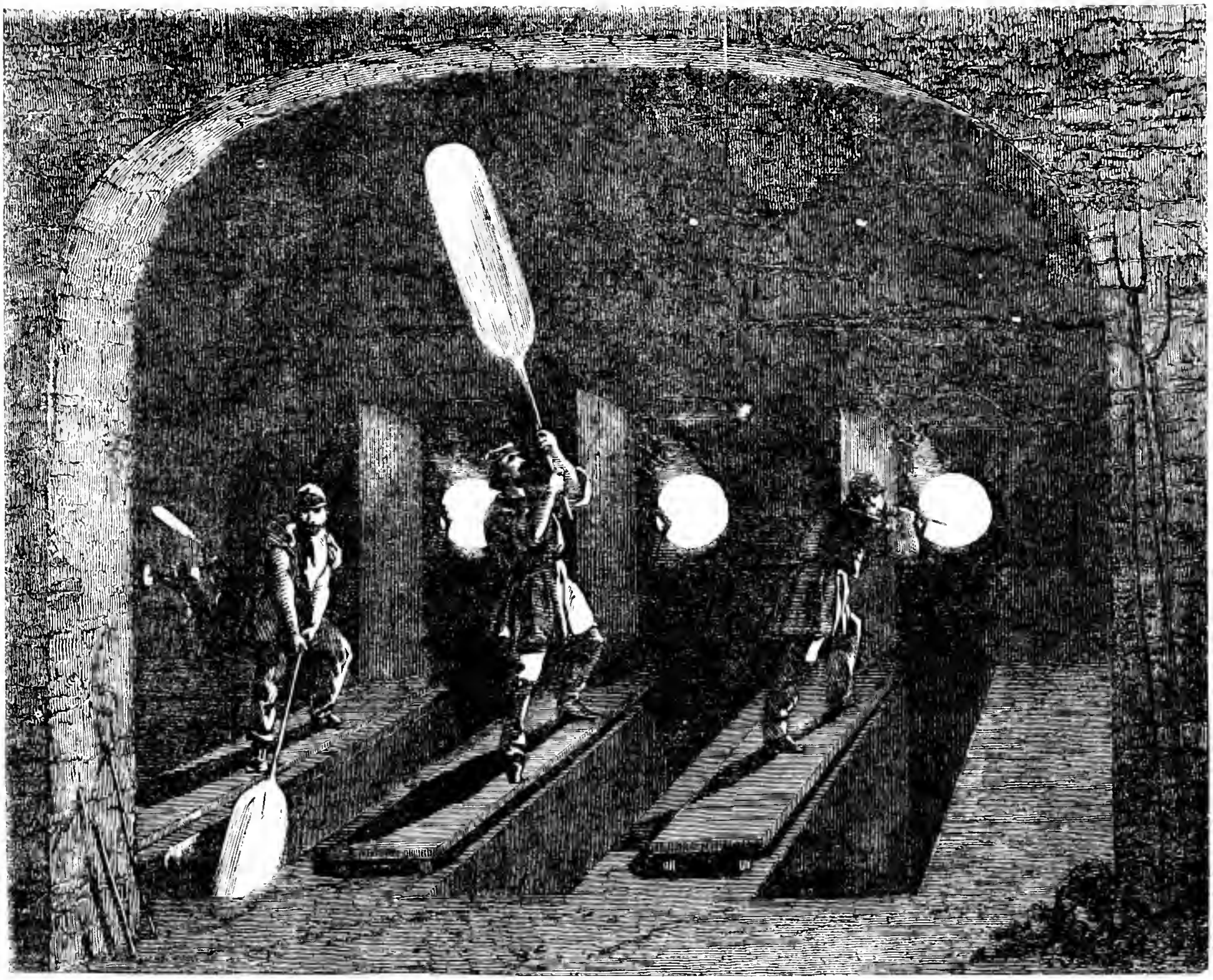
AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

GLASS MANUFACTURES.

GLASS-BLOWING.

THE manufacture of glass is one of great and daily increasing importance in this country; the application of this material to many uses heretofore unthought of being daily on the increase; thanks to the liberal policy which a few years ago abolished those fiscal burthens which had operated as a bar to enterprise and progress. The subject is one of peculiar interest in connexion with the Great Exhibition of Industry of 1851, as, but for the enfranchisement of the glass manufacturer, the building in which that unrivalled display was held could never have been constructed.

The time at which glass was invented is very uncertain. The popular opinion upon this subject refers the discovery to accident. It is said (Plin., *Nat. Hist.*, lib. xxxvi., c. 26), "that some mariners, who had a cargo of *nitrum* (salt, or, as some have supposed, soda) on board, having landed on the banks of the river Belus, a small stream at the base of Mount Carmel



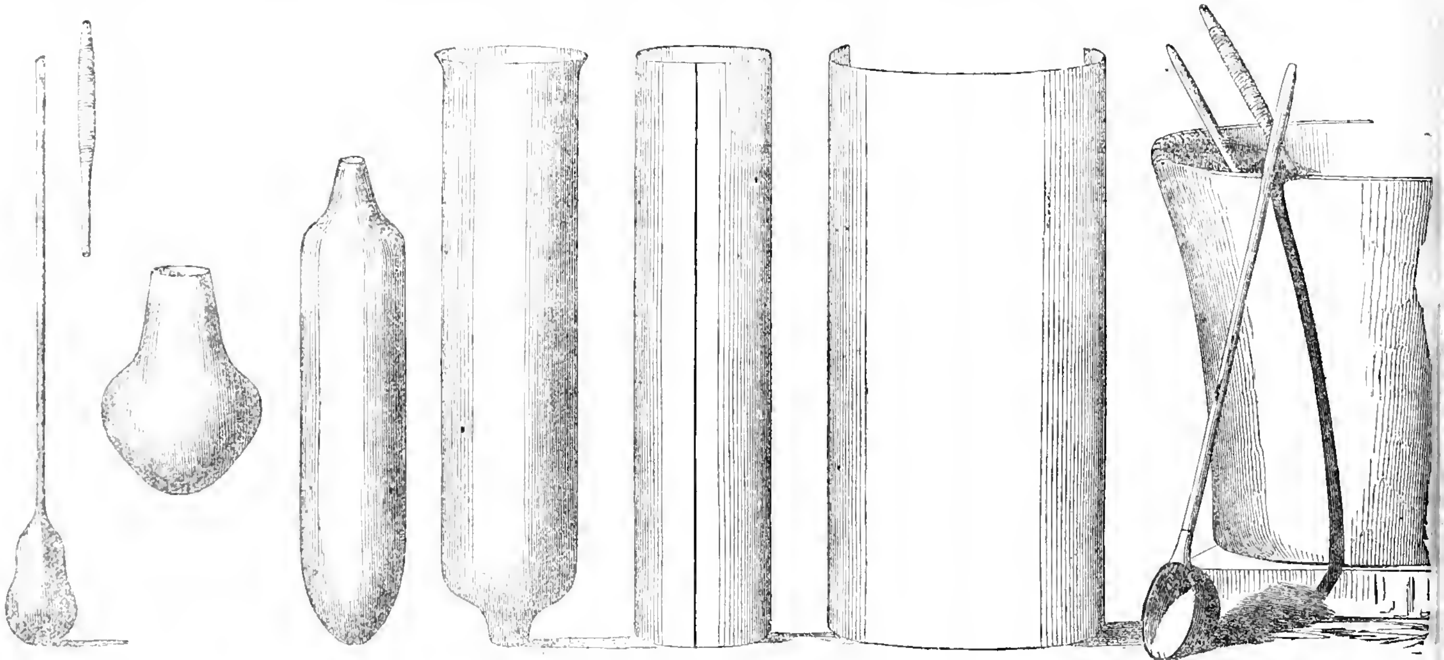
GLASS-BLOWING.

in Palestine, and finding no stones to rest their pots on, placed under them some masses of nitrum, which, being fused by the heat with the sand of the river, produced a liquid and transparent stream: such was the origin of glass." The ancient Egyptians were certainly acquainted with the art of glass-making. This subject is very fully discussed in a memoir by M. Boudet, in the "Description de l'Egypte," vol. ix., Antiq. Mémoires. The earthenware beads found in some mummies have an external coat of glass, coloured with a metallic oxide; and among the ruins of Thebes pieces of blue glass have been discovered. The manufacture of glass was long carried on at Alexandria, from which city the Romans were supplied with the material; but before the time of Pliny the manufacture had been introduced into Italy, France, and Spain (xxxvi., c. 26). Glass utensils have been found among the ruins of Herculaneum.

The application of glass to the glazing of windows is of comparatively modern introduction, at least in northern and western Europe. In 674 artists were brought to England from abroad to glaze the church windows at Weremouth, in Durham; and even in the year 1567 this mode of excluding cold from dwellings was confined to large establishments, and by no means universal even in them. An entry then made in the minutes of a survey of Alnwick Castle, the residence of the Duke of Northumberland, informs us that the glass casements were taken down during the absence of the family, to preserve them from accident. A century after that time the use of window-glass was so small in Scotland that only the upper rooms in the royal palaces were furnished with it, the lower part having wooden shutters to admit or exclude the air.

The earliest manufacture of flint-glass in England was begun in 1557, and the progress made in perfecting it was so slow, that it was not until near the close of the seventeenth century that this country was independent of foreigners for the supply of the common article of drinking-glasses. In 1673, some plate-glass was made at Lambeth, in works supported by the Duke of Buckingham, but which were soon abandoned. It was exactly one century later that the first establishment of magnitude for the production of plate-glass was formed in this country, under the title of "The Governor and Company of British Cast Plate-Glass Manufacturers." The members of this company subscribed an ample capital, and works upon a large scale were erected at Ravenhead, near Prescot, in Lancashire, which have been in constant and successful operation from that time to the present day.

At an early period of its history in this country the glass manufacture became an object of taxation, and duties were imposed by the 6 and 7 William and Mary, which acted so injuriously, that in the second year after the act was passed one half of the duties were taken off, and in the following year the whole were repealed. In 1746, when the manufacture had taken firmer root, an excise duty was again imposed, at the rate of one penny per pound on the materials used for making crown, plate, and flint glass, and of one farthing per pound on the same used for making bottles. In 1778 these rates were increased 50 per cent. upon crown and bottle glass, and were doubled on flint and plate glass. These rates were further advanced from time to time in common with the duties upon most other objects of taxation, and in 1806 stood as follows:—On plate and flint glass, 49s. per cwt.: on crown and German sheet-glass, 36s. 9d. per cwt.; on broad glass, 12s. 3d., and on common bottle-glass, 4s. 1d. per cwt. In 1813 those rates were doubled, and with the exception of a modification in 1819 in favour of plate glass, then reduced to 3*l.* per cwt., were continued at that high rate until 1825. In that year a change was made in the mode of taking the duty on flint-glass, by charging it on the weight of the fluxed materials instead of on the articles when made, a regulation which did not affect the rate of charge. In 1830 the rate on bottles was reduced from 8s. 2d. to 7s. per cwt. The only further alteration hitherto made in these duties occurred in 1835, when, in consequence of the recommendation contained in the thirteenth report of the Commissioners of Excise Inquiry, the rate upon flint glass was reduced two-thirds, leaving it at 2d. per pound, a measure which was rendered necessary by the encouragement given under the high duty to the illicit manufacture, which was carried on to such an extent as to oblige several regular manufacturers to relinquish the prosecution of their business. [*Penny Cyclopædia.*]



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SUCCESSIVE STAGES OF GLASS-BLOWING.

Since the alteration in the tariff, the manufacture of glass in this country has received an immense extension, and in several branches of the art we have outstripped the foreigner, who a few years since maintained against us a flourishing competition. In the preparation of the raw material, with one or two exceptions, we occupy the highest place, and have acquired this advantage by our large capital, by our improved chemical knowledge, and by the indomitable energy of our character. Even the foreigner acknowledges our superiority in these respects, and in taste and colouring he also admits that we have made considerable progress.

"For a long time," says M. Stéphane Flachet, "England has excelled us in the manufacture of glass, especially crystal glass. The precise cause is not known; it does not appear in the mode of fusing the materials—more probably it may be attributed to the purity of the lead which they use. We know how poor France is in this important respect, having imported, for several years past, from fifteen to sixteen millions of kilogrammes of that metal, principally from Spain. . . . . . . The French glass is inferior to the English in point of colour, and changes much sooner when exposed to the air. Our manufacturers declare that this difference does not arise from an inferiority of workmanship, but from the limited means which we possess of purchasing the article, and which in a great measure may be attributed to the *minute division of the soil.* In order to reduce the price of glass to the condition of the purchaser, our manufacturers have recourse to an extra infusion of alkali, which, being slowly absorbed by the atmosphere, causes the glass to lose its transparency."

Glass may be regarded, generally speaking, as an admixture of three kinds of ingredients—silica, alkali, and a metallic oxide. The silica is the vitrifiable ingredient, the alkali is the flux, and the metallic oxide, besides acting as a flux, imparts certain qualities by which one kind of glass is distinguishable from another. If silica be exposed to the strongest heat it will resist fusion, but if it be mixed with an alkali, such as potash or soda, and the mixture be then submitted to the same temperature, a combination will ensue which takes the form of a liquid, and when cooled becomes transparent. The quality of glass mainly depends on the proportions in which the silicious matter and the alkali are combined, on the tempe-

rature to which they are exposed, and on the skill with which the entire process is performed. When a perfect combination of the materials is not secured, the glass is covered with dark spots or particles, and other inequalities, which are called striæ. There are three kinds of glass in ordinary use—crown glass, plate-glass, and flint-glass. The silicious sand, which forms the base of the manufacture of each, is principally derived from Alum Bay, in the Isle of Wight; from Lynn, in Norfolk; and from Aylesbury, in Buckinghamshire. The materials for flint-glass are nearly as follows:—One part of alkali, two parts of oxide of lead, three of sea-sand, and a small portion of the oxides of manganese and arsenic. The oxide of lead is employed as a powerful flux; it also imparts a great lustre to the metal, and causes it to be more ductile when in a semi-fluid state. The manganese renders the glass perfectly colourless. When these ingredients are mixed, it is called the *batch*, and the mixture is generally of a salmon coloured hue, the red tinge being given by the oxide of lead.

"Who," says Dr. Johnson, "when he first saw the sand or ashes by a casual intenseness of heat melted into a metalline form, rugged with excrescences and clouded with impurities, would have imagined that in this shapeless lump lay concealed so many conveniences of life as would, in time, constitute a great part of the happiness of the world? Yet by some such fortuitous liquefaction was mankind taught to procure a body at once in a high degree solid and transparent; which might admit the light of the sun, and exclude the violence of the wind; which might extend the sight of the philosopher to new ranges of existence, and charm him at one time with the unbounded extent of material creation, and at another with the endless subordination of animal life; and, what is of yet more importance, might supply the decays of nature, and succour old age with subsidiary sight. Thus was the first artificer in glass employed, though without his knowledge or expectation. He was facilitating and prolonging the enjoyment of light, enlarging the avenues of science, and conferring the highest and most lasting pleasures: he was enabling the student to contemplate nature, and the beauty to behold herself."

Owing to the injurious operation of the Excise duty upon glass as already stated—since happily abolished by Sir Robert Peel—the English manufacture was long inferior to the French for plate-glass, and to the Bohemians for coloured and ornamental glass. Since the exciseman was released from his attendance at the glass-house, the English have been gradually improving themselves in the manufacture of every variety of this beautiful article, adopting processes new to England, but which had been long in use in other countries, where the manufacturer was not impeded by the operation of impolitic laws. Among these new processes, that of the manufacture of plate-glass, in the mode represented in our Illustration, is one of the most interesting. When the Messrs. Chance of Spon-lane, near Birmingham, took the contract for the supply of the large quantity required for the Crystal Palace, amounting to nearly 400 tons, they found it necessary to import a few foreign workmen, in consequence of a scarcity of English hands sufficiently skilled and experienced to complete the order within the time specified. The process represented by the artist is very simple and beautiful, but requires a steady and practised hand. When the requisite weight of "metal" is taken from the furnace by the blower, it is blown into a spherical form in the ordinary manner. It is then, after being re-heated in the furnace, swung in the manner represented, above the head and below the feet of the workman, until it assumes the form of a cylinder. The workman stands upon a stage opposite the mouth of the furnace, with a pit or well beneath his feet, six or seven feet in depth. He swings and balances the molten metal—firmly affixed to a knob of glass at the end of a long iron bar, or blowing tube—first above and then beneath him, until it gradually expands to the size which the original quantity of "metal" was estimated to produce. The slightest miscalculation of his power of swinging it, or deviation from the proper course, might dash the hot glass either against the side or end of the pit or well, or against the wall of the furnace—or, worse than all, against the body of a fellow workman or of a spectator. No such accidents ever happen, though the stranger unaccustomed to the sight is for a while in momentary dread of some such result. When swung to the proper length, the cylinder is about four feet long, and twelve inches in diameter. The next operations are to convert it into a tube, by disconnecting it from the blowing-iron, and removing the bag-like extremity. These processes are performed by boys, with strings of red-hot glass, which easily cut through the yielding metal." The boys then take the tubes under their arms, and remove them to another part of the building, where they stand on end, like chimney-pots, to await the operation which shall convert them into flat sheets of glass. This is also very simple. The tube is cut down the middle, and in this state placed in the "flattening kiln," where the moderate application of heat, aided by a gentle touch from the attendant workman, brings it flat upon a slab or stone. It is then gently rubbed, or smoothed, with a wooden implement, and passed into a cooler part of the kiln, where it soon hardens. It is then tilted on edge, and the manufacture is complete. It is afterwards cut in the ordinary way to the required size.

The series of illustrations on pages 49 and 50, represent the various implements used in melting and blowing glass, and the appearance it presents in its successive stages. These were copied from samples exhibited by Messrs. Hastly and Co. of Sunderland, in addition to a great variety of specimens of the actual product for windows, conservatories, &c. On the left is the melting-pot, which stands nearly five feet high (No. 7, on the cut). No. 1 shows the blow-pipe and ball of metal, as taken from the pot; No. 2, sheet-glass as formed by the blower in a wooden mould; No. 3, sheet glass when swinging in the process of blowing; No. 4, sheet-glass when fully blown; No. 5, sheet glass when finished by blowing; No. 6, sheet glass when partially flattened.

JEFFREY'S MARINE GLUE.

The marine glue is one of the inventions which have resulted from experiments made to attain in some measure the same object by different means. Messrs. Jeffrey, Walsh, and Co. exhibit a great variety of specimens of their marine glue as applied to various parts of vessels, in order to show the strength and tenacity attainable by the use of this important substance. Many years ago Mr. Jeffrey turned his attention to a process, by galvanic action, of producing copper sheathing suitable for ships' bottoms; but, after numerous experiments and considerable expense, finding the cost of production of the copper sheathing by his new process to be equal to that of the copper-plates for ordinary use for the same purpose, he abandoned his scheme. Nevertheless, his investigations on this important subject led to "the idea of employing resins insoluble in water as an effectual protection to ships' bottoms." The result was the composition which is known as marine glue, and which is now so extensively used in the navy. It consists simply of three ingredients, viz., caoutchouc, coal naphtha, and shell-lac, in proper proportions. It requires several days to dissolve the caoutchouc previously to the addition of the shell-lac. The various specimens of the application of marine glue may be mentioned:—1. A piece of the mast of the *Curaçoa* frigate, after her return from South America. The glue was found to be inseparable even by the application of the wedge. 2. The piece of mast put together with the marine glue, and which had been subjected to a pressure of 22 tons, by means of the hydraulic press, before a splinter could be effected. In order to show the great additional strength of the main-mast, the fore-mast, and the mizen, by the use of the marine glue, it is only necessary to observe that the number of feet of surface joined in the three masts is equal to 2128; so that only taking three tons to the foot, we have an additional strength put into these masts of not less than 6384 tons, a thing unprecedented. 3. A block of elm, about 12 inches square, which had been put together with the marine glue, and subjected to an explosion of gunpowder. At the conclusion of the trial, it was found that the seam or joint was perfect. 4. The piece of a deck put together with the glue was taken from a vessel, the interior of which was destroyed by fire, and, although the under side was found considerably charred, the upper side, including the glue, was perfect. 5. Mr. Jeffrey, at the request of Sir I. K. Brunel, prepared a cannon ball of oak, about seven inches in diameter, which was fired at Woolwich, in 1842, at an angle of forty-five degrees, to ascertain the effect of concussion on the joint when rebounding from the earth. On an inspection of this interesting specimen, it will be found that the joint is still perfect. 6. A block of deal about twelve inches square, with a surface glued of similar extent. The wood was shattered at four tons. Thus, taking three tons per foot, we have additional strength of 25,000 tons distributed over the hull of a first-rate. 7. Short length of a model mast, of about 8 inches in diameter, exploded with gunpowder. Although the wood was rent, the splinters were confined by the marine glue. 8. Specimen, showing the method of converting rectangular into circular timber, by dividing the rectangular piece by a segmental cut at the radius required, and then placing the under piece above the upper piece, and connecting the two pieces together with marine glue. The ribs of the roof of the Transept of the Palace of Industry were thus formed, not, however, having the use of marine glue at the joints. 9. A mahogany deck, paved with marine glue; and finally four seams, two of which have been subjected to the same temperature under the line. The effect of the sun on the seams made of pitch has been known to melt it away to the depth of an inch in parts, while the glue in the first case remains perfect.

Preservation of the Crystal Palace.—On Tuesday evening, in accordance with the resolution passed at a previous meeting, declaring the desirability of preserving the Crystal Palace, a meeting of the inhabitants of De Beauvoir Town, Kingsland, was held at the Sussex Arms Tavern: Mr. John Carr in the chair.—Mr. Addiscott proposed a resolution to the effect that the Crystal Palace, on account of the many glorious associations with the Exhibition of 1851, and being itself a work of art and beauty, ought to be preserved as a national memorial of that great and successful undertaking.—Mr. Hughes supported the resolution, which was carried unanimously. The second resolution, which was proposed by Mr. Russell, enforced the necessity of public meetings on the subject, and also of petitioning Parliament with a view to preserve the palace either as a winter garden, or for other purposes beneficial to the public. The resolution was carried, and a petition to the House of Commons embodying the sentiments of the meeting was afterwards proposed by Mr. T. Beard, the honorary secretary of the committee, and unanimously adopted.

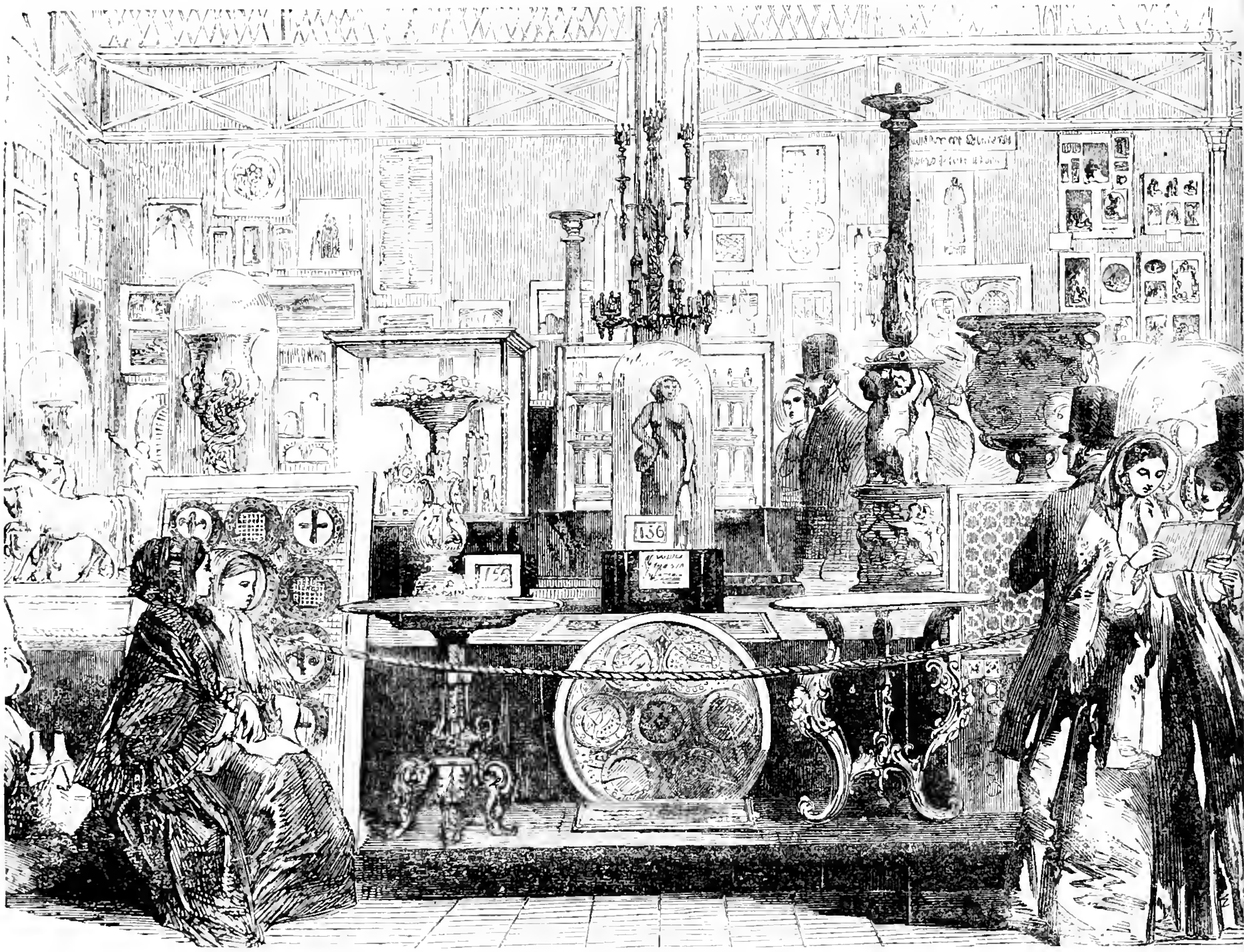
Knighthood Offered.—We learn on good authority that knighthood has been offered to Mr. W. Cubitt, the commissioner superintending the erection of the building, to Mr. Paxton, and to Mr. Fox.—*Morning Paper.*

THE ARTS OF DESIGN AND DECORATION.

THE FINE ARTS DEPARTMENT.

THE exclusion of the painter's art from participation in the scheme of the Great Exhibition was an error of judgment on the part of the Commissioners, which it seems utterly impossible to account for. At a time when the application of decoration upon the true principles of design is being attempted, under the auspices of Government committees, not only in the palaces of the nation and the houses of the great, but also in the more humble abodes of the middle classes (through the operation of Schools of

And if good so result from observations on sculpture obtained in this way, by millions who never saw a work of sculpture before, how much more useful to them would be some notion of the principles and practice of painting, involving both composition and colouring—an art much more intimately and generally applicable to the purposes and requirements of social life;—and if a comparison by the more critical portion of the community of the works, we can hardly venture to say the schools, of sculpture of various nations, be interesting and instructive, would not a similar comparison of works of painting be at least equally so? The importance of such a comparison to English art it would be impossible to overrate, when we reflect upon the comparatively short and chequered career which art, since its revival, has had in this country. It is scarcely more than a



FINE ARTS COURT.

Design)—at a time when furniture, dress, and utensils for the table all come in for a share of the improved taste of an age ambitious in art, it seems an act of fatuity, when preparing a Grand Exposition of the Works of Industry of all Nations, to exclude from the lists that very branch of art which affords the highest resources for decoration, as well as the most abundant and varied examples both of composition and colouring. The assiduity and interest with which the thousands who thronged to the Exhibition in Hyde-park examined the miscellaneous contributions of sculpture from all nations, must assure us that the masses are susceptible of enjoyment from the contemplation of works of fine art; and although many of the specimens here presented to them fall far short of the standard of excellence, and although the impromptu criticisms of the multitude by no means evince an advanced taste, yet we feel so much confidence in the ultimate triumph of truth, which in art is beauty, that we are inclined to look for practical good results even from this scrambling course of self-education, amid a sort of wilderness of wild flowers.

century and a half that art has held any position amongst us; since Sir James Thornhill, starting in rivalry to La Guerre, the favourite decorator of the mansions of the nobility of that day, received a commission from the State to paint the interior of St. Paul's Cathedral and the hall of Greenwich Hospital, in which he was assisted by a German named André, and which he contracted to do at the rate of 2*l*. per square yard! It is not a century since the first attempt to establish an Academy of art was made, inaugurated by the learned and admirable discourses of Sir Joshua Reynolds; and in the course of that period, what have we done towards the formation of a school of art? what definite purpose or rules of taste have we arrived at? The answer to these questions must be given by a silent and significant pointing to the walls of the various exhibition rooms in Trafalgar-square, Suffolk-street, and Pall-Mall, where all has long been caprice, and glitter, and wild confusion, and where now a portion of our exhibitants seem to seek for unity of purpose, by devoting their pencils to a miserable copyism of the poorest mediæval models. Thus, whilst in little more than two centuries (Giotto died in 1336, Raffaelle in 1520), revived art in Italy arrived at its highest point of excellence and power under a Raffaelle, who founded a school which, in the persons of a Giulio Romano, a Garofalo

and a Parmegiano, survived some time after him in England, in about the same period, after various unconcerted efforts, and fostered by much indiscriminating patronage, we find art, having never once attempted a flight of the highest ambition, degenerating at once into the stiff and inanimate mannerism of the twelfth and thirteenth centuries.

There is no hope of remedy for such a state of things, but in wholesome exposure in broad daylight of public scrutiny. We must meet extravagance with extravagance; and native affectation being confronted by conceits from abroad (where there is much of the same error to complain of), shame and mutual ridicule may correct much; whilst the strong arm of criticism and the loud voice of popular condemnation will do the rest.

But it is not only to an exhibition of modern art of all nations that we should have looked as the means of educating the public taste. The vast avenues of the Crystal Palace, which might, without much trouble, have been prepared for the purpose, would have afforded an admirable opportunity for forming an exhibition of by-gone art, arranged in order of schools; an exhibition of the highest interest and utility, which, from the nature of circumstances, has never yet been carried into effect, and for which the spacious resources of the World's Fair in Hyde Park afforded the first, and perhaps the last, opportunity. Of the forthcoming of the necessary materials for furnishing forth such an exhibition, we cannot entertain a doubt, had the opportunity been afforded, seeing the alacrity with which foreign potentates, and our own most gracious Sovereign and her Consort, have freely sent in the costliest articles of jewellery and *vertù* in their possession, to enhance the attraction of the Exhibition; and how their example has been followed by wealthy public companies, by noblemen and private gentlemen, each anxious to contribute their or his mite to the general splendour, but who, we are convinced, would have been far more proud to have shown a Raffaelle or a Rembrandt, than a "jewelled hawk" or a necklace once the property of the poor King of Kandy; and the public—the more intellectual portion of it—would have been much more obliged to them for such contributions, and the men of art, and the men of taste of all Europe, would have thanked them for helping to make up a show of precious worth and enduring interest, the recollection of which would have served to light their paths during a life of toil and study in the pursuit of excellence and beauty in art.

It is useless to enlarge upon the practical advantages and the intellectual charm of such an Exhibition; it has been denied us: and although a department in the Crystal Palace has been named the "Fine Arts Court," the very existence of such a compartment is a mockery when coupled with the announcements that

"Oil paintings and water-colour paintings, frescoes, drawings, and engravings, are not to be admitted, except as illustrations or examples of materials and processes employed, and portrait busts are not to be admitted.

"No single artist will be allowed to exhibit more than three works."

ORIGIN OF THE QUARREL OF THE GUELPHS AND THE GHIBELLINS. BY F. R. PICKERSGILL, A.R.A.

It is true that this regulation is not very clearly worded, and that it might be evaded, as all ill-advised and purposeless laws may be; almost every oil or water-colour painting, or drawing, or engraving, being more or less available in "illustration of materials or processes employed." Indeed, we could name several publishing houses who have managed to gain admission for a variety of engravings, either published or in progress, and water-coloured pieces destined in due course for the hands of their engravers. And as to "fresco" painting; why should that be excluded, if distemper and other like processes be admitted, in which we have abundant examples of wall decoration? We have abundant evidence on every side, moreover, that the rule has been relaxed as regards the number of works to which each exhibitor was to be restricted. But still the general object of the rule, whatever that object was, has been effected; and the "Fine Arts Court" has been crowded with very ordinary terra cotta casts, including brick-coloured and by no means delicately treated nymphs of heavy proportions, wax models, wax flowers, nick-nackeries in colour printing, and fancy stationery, card models of houses and gardens, dolls dressed in court and other costume, egg shells carved and engraved with fancy views, models in willow-wood, models in paper, and every conceivable absurd toy which could enter into the conception of a boarding-school miss, and which render this department, as far as it goes, a positive blot upon the otherwise fair face of the Great Industrial Exhibition of all Nations.

And it is really curious to see the shifts which poor Art, being excluded under its ordinary forms, has managed to represent itself in the Great Congress of Industry, and what inconsistencies and waste of space this has led to. Although "oil painting and water-colour painting, fresco, drawing, and engraving" have been declared inadmissible in their general sense—that is, in their best and noblest performances—the pictorial genius of Europe has manifested itself abundantly on all sides in almost every conceivable material but the prohibited canvas; upon porcelain, from France, from Vienna, from Milan, from Dresden; upon glass from Berlin and other

parts of Germany: upon tin from Wirtemburg; upon plate-iron from Thuringia. Then we have mosaics from Rome not a few, and beautiful of their kind: and from Munich we have a collection of "stereochromic" pictures, executed upon wood covered with mortar, "a process intended as a substitute for (the prohibited) fresco-painting." Sir William Newton has been allowed wall-room for several pictures upon ivory, representing "The Homage at the Coronation," "The Marriage of her Majesty," and "The Christening of the Prince of Wales," &c.; but their reception in his case may perhaps be explained by the announcement that the ivory in these works is "joined together by a process of his own invention." Mr. Haslem and Mr. Bone have some enamel pictures on gold—many of them Royal portraits, others copies from old masters; and Mr. Essex shows "an extensive collection of enamel paintings," copies from works in Royal and noble collections. In short, whilst High Art has been rigorously excluded, Little Art has been greatly favoured. As to the prohibition of engravings, it has been found impossible to carry it out; and accordingly we find whole shop-loads of them in various styles in different parts of the Building, some framed, others loose. In addition, we have been startled here and there with some wonderful imitations of engravings, and pen and ink drawings, in silk, in human hair, in crape, &c.: which, as soon as the first impulse of curiosity is over, only leave upon the mind of the spectator a feeling of disappointment and irritation.

Whilst upon the subject of simulative processes, we may refer to some "poker drawings," upon wood, by the Rev. W. Calvert, and some specimens of the art of "xulopyrography," or charred wood engraving, exhibited by Lieut. C. Marshall and Mr. J. T. Mitchell, and which are entitled to rank in a higher category than the contrivances named at the close of the preceding paragraph. The latter productions are somewhat similar in appearance to old sepia drawings, and in their process of working have something in common with poker drawings. The difference between charred wood carvings, or engravings, and the said "poker drawings," is that the former are cut from the surface of hard and white wood, which has been previously completely charred over, the lights and shadows being effected by scraping gradually away the black surface to the necessary depth, according to the shade required, going below where the burning extends for the absolute lights: whereas "poker drawings" are burnt on the surface of white wood, the lights being left and the shades burnt in. One of Mr. Mitchell's specimens is taken from a rare mezzotinto engraving by Prince Rupert, who, by the way, was long supposed to have been the inventor of the last-named process, though of this there is some doubt, it being probable that he learnt the art from Colonel Louis Von Siegan. The subject is "The Execution of St. John the Baptist," after Spagnoletti. The other specimen by this exhibitor is taken from Uwins "Chapeau de Brigand" (in the Vernon Collection), and is of more minute workmanship than the preceding one. Lieut. Marshall exhibits, we think, three or more of his works in this line, the most important of which is after Raffaelle's cartoon of "St. Paul Preaching."

The engraving which accompanies the present article is taken from a small picture ("the Origin of the Quarrel of the Guelphs and the Ghibellines,") by F. R. Pickersgill, A.R.A., which has been admitted, not as a specimen of art, but of Rowney's silica colours, in which it is painted. Besides this, we have one or two other specimens of a like kind, and exhibited for a like purpose: as, for instance, two of Concannon's new method of aërial tinting by calcined colours, and some designs in the crayons and chalks of some other manufacturer, whose name we have forgotten. Beneath these, and some other gaudier displays of colours, rainbow or prism fashion, are ranged the brushes, palettes, and other implements necessary for using them: and so complete and instructive is this exposition of art requirements considered by Mr. Rowney, one of the exhibitors, that he places a little plaster group, entitled "Letting the Cat out of the Bag," in the midst of his compartment, as much as to say that the mysteries of the craft exist now no longer, and that amateurs may all be artists if they please to lay in a stock of the necessary materials. In Mr. Ackerman's department we were agreeably struck with a very elegant colour-box, made of papier maché.

The above flying notes, though unimportant in themselves, may be interesting some future day, as affording a notion of the position held by the Fine Arts in the Great Exhibition of Industry of All Nations of 1851.

THE QUEEN'S WITHDRAWING-ROOM AT THE CRYSTAL PALACE.

The Engraving in page 60 represents the waiting room erected for the reception of her Majesty near the North entrance of the Building, having particular reference to the surrounding group of anxious spectators, on the occasion of the inauguration of the Crystal Palace, on the 1st of May. This elegant little apartment was chiefly composed of rich tapestry, the interior being lined with pale light blue and white silk, fluted. The furniture was of a very costly character, combining lightness of appearance with splendour of effect. The sofa and chairs were carved and gilt, and covered with light blue silk damask. The carpet, of rich Brussels, was a flowered pattern. Flowers, tastefully disposed, lent their aid to give a pleasing and lively effect to the picture. In the rear of the principal room was a smaller apartment, separated from it merely by a draped partition, in which was a handsome cheval glass, in a gilt frame and stand. Crowds of persons daily thronged to view this little *bijou* of a boudoir, at a respectful distance however—a cordon being drawn around it, guarded by a policeman.

HARDWARE.

BUTTONS.

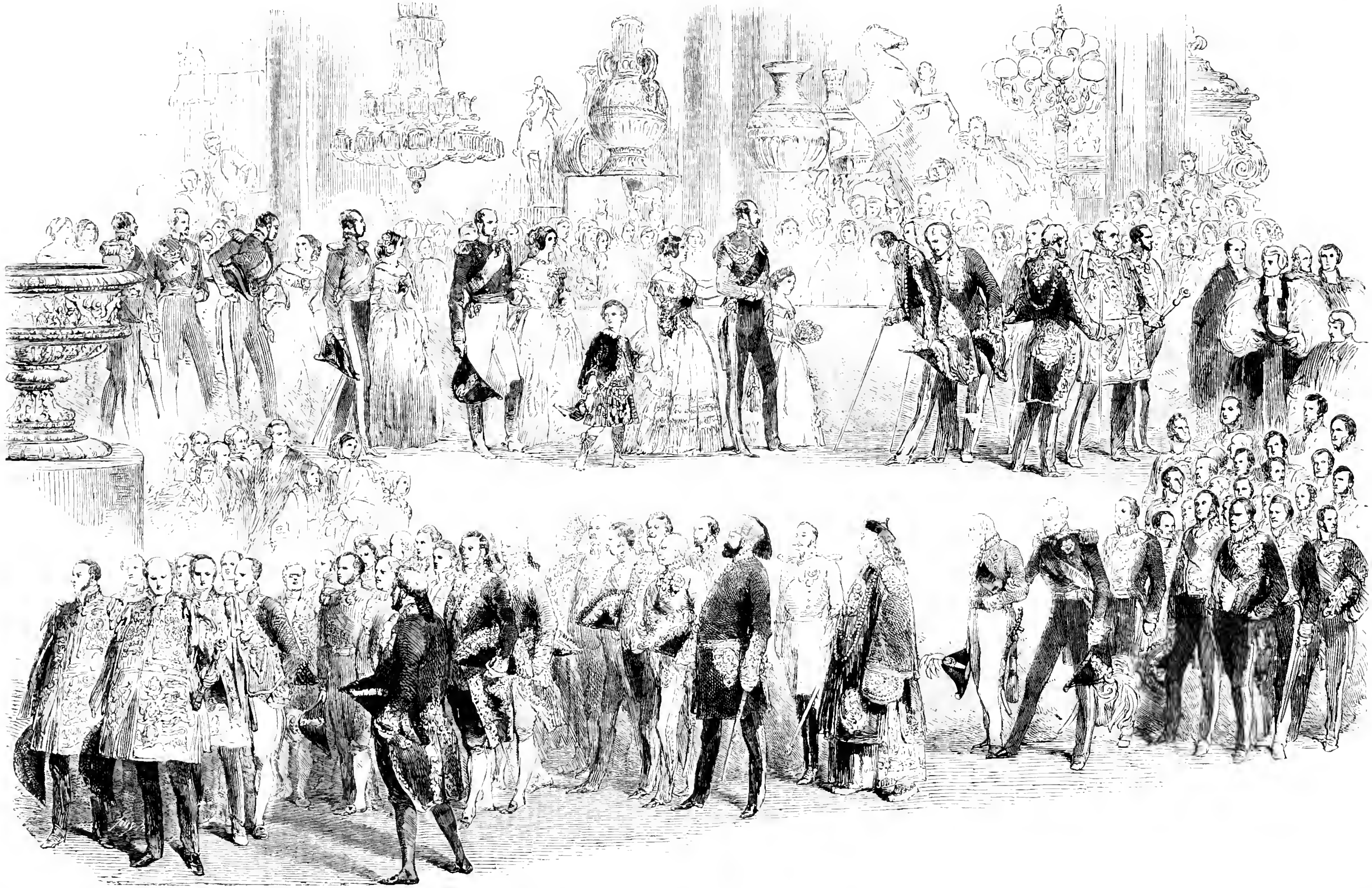
THE oldest of the Birmingham buttons seem to have been a plain flat button, of the waistcoat size, which, a hundred years ago, was sold at *4s. 6d.* a gross, and which is still manufactured at 1s. *6d.* a gross. Then came a very large button, of the size of half-a-crown, with ornamental devices on it; but this was dear. It was the gilt and plated button, introduced between 1797 and 1800, which made the great "hit" in the trade. This button became immediately fashionable, and continued so for a quarter of a century. Everybody must remember the days when the blue coat, with its seemly array of glittering brass buttons, was the not unbecoming garb of a gentleman. At the end of twenty-five years, it was pushed from its popularity by the covered, or Florentine button; but some years ago a dashing attempt was made to revive its glories by means of a deputation which the trade despatched to London. We do not learn that they committed a similar inadventure to that of the poor wig-makers, who went up to petition the throne, some years previously, against the practice of wearing one's own hair, but, going in their own natural hair, so scandalised the mob by their inconsistency, that they had it all cut off for them by the rabble. Armed with sets of beautiful bright buttons, the discomfited makers forced their way to the foot of the Throne, and, tendering their article, besought Royalty to pity their misfortunes. They represented that the old button was very handsome, and that thousands were reduced to poverty by the introduction of the new one: and they therefore entreated the King (George IV.) to encourage the metal button made by wearing that article. The same appeal was made to other influential persons; and not only the King, but the Duke of Clarence, several of the Ministers, many members of the nobility, the Lord Mayor, and other notables, accepted the proffered buttons, and promised to wear them. The experiment was successful, a reaction took place, and the dark button, as we well remember, went aside for a few seasons. Again we all came out glittering—

To midnight dances and the public show.

But the triumph was not long, and that it was not longer, was the fault of the Birmingham people themselves. Some manufacturer invented or introduced a cheap method of gilding the buttons. The trade called it French gilding, the workmen named it "slap dash." It made the buttons look remarkably brilliant for a very little while, but they tarnished almost immediately, even before the retailers could sell them; and if placed in all their brightness on a new coat, they looked shabby in a fortnight. This discovery—perhaps it is refining too much to suppose that it was introduced by a friend to the Florentine button—fatally and finally damaged the metallic cause, by casting discredit upon the whole manufacture: people left off ordering brass buttons, and by 1840 the trade was again ruined. A second attempt at obtaining illustrious intervention was made: Prince Albert was assailed by a deputation, and the sympathies of the press were invoked by the metal-buttonist. But the charm would not work twice, and you never see a gilt button now except upon the terribly high-collared coat of some terribly devoted adherent to old fashions, who may be observed nestling in the corner of the stage box on first nights, and who, if he speaks to you, is sure to growl out the unreasonable intimation, that "You ought to have seen Joe Munden, sir, in a character like this. Munden, sir, *was* an actor."

Except the buttons required for the military and naval services, and for "Jeames," the metal article is out of date, and covered buttons have it all their own way. The Florentine or covered button was first introduced into Birmingham in 1820, and it derives its name from the Florentine cloth with which it is covered. It is composed of five pieces: first, the cover of Florentine or silk; second, a disc of metal which gives the shape to the button: third, a somewhat smaller disc of brown pasteboard or wadding: fourth, a disc of coarse black linen or calico: and fifth, a disc of metal from which an inner circle has been punched out, so that the cloth or calico above may slightly protrude, and form a shank of the button. Young girls cut the various discs with a punching machine, and the last operation is to place the five pieces in regular order in a small machine constructed to hold them—an arrangement carried out by a number of little children under a woman's superintendence; and then this machine, which has been compared to a dice-box, is brought under a press, which with a touch fastens the whole bottom together with a neatness and a completeness to which any one who will examine his coat-button can be witness.

Horn buttons are made from the hoofs of horned cattle: those of horses are not available for the purpose. The hoofs are boiled until soft, and cut into halves; then "blanks" are punched out. The blanks are placed in



THE ROYAL PROCESSION AT THE OPENING OF THE GREAT EXHIBITION.—MAY 1.

Throughout the day the parks and the lines of thoroughfare presented a scene of indescribable animation: crowds of people rushing hither and thither: carriages, cabs, carts, and omnibuses crammed inside and out, forming a difficult passage through the dense uncounted and uncountable throng. In short, the opening of the "World's Great Fair" appeared to be kept by all, with one consent, as a national holiday—all the shops in Knightsbridge, and a great proportion of those in Piccadilly and other neighbouring streets, being closed.

The hour fixed for the opening of the various doors to the holders of season tickets was nine o'clock; but long before that time every possible point of access to the building was thronged with well-dressed persons—a great proportion of them ladies—eagerly waiting for admission. Considering the numerous number who eventually were admitted—some twenty-five thousand or thirty thousand at least—the proceeding was conducted with wonderful order and regularity, and with much less personal inconvenience than generally attends the congregating of large assemblies.

The centre area of the intersection of the naves and transept was that set apart for the reception of her Majesty and her Court, and the other distinguished persons who were to take part in the interesting ceremonies of the day. At the northern portion of this area a dais was erected, covered with a splendid carpet, worked by 150 ladies for her Majesty, and graciously accepted by her; and upon this was placed a magnificent Chair of State, covered with a velvet robe, or mantle of crimson and gold. High over head was suspended an octagon canopy, trimmed with blue satin and draperies of blue and white. Before the chair rose the beautiful glass fountain, glittering as a precious stone in the morning beams. Behind rose the stems of the tropical plants and the stately elm, one of the most agreeable and refreshing parts of the whole view. Along the galleries of the main western avenue, the department for British goods, a succession of the most beautiful carpetry was suspended, like bannerets, only more splendid, in a knightly hall of old. Along the foreign avenue everything stood revealed in its best, and the vista along the whole line was perhaps the most splendid and extensive, as a piece of art and human contrivance, ever presented to human view.

By 11 o'clock the honourable corps of Gentlemen-at-Arms, in their gay uniforms had taken up their station at the rear of the daïs, whilst the time-honoured body of Beefeaters were ranged along the outer line of procession. The trumpeters and heralds stood ready to proclaim the arrival of the Queen of these isles and the heralds to marshal the order of her coming.

At half-past eleven the Duke of Cambridge arrived at the north door, but did not enter the area, awaiting the arrival of the Duchess of Kent, who, accompanied by the princess Mary of Cambridge, followed shortly after him. Their Royal Highnesses now entered the retiring room, which had been prepared for her Majesty's reception, an elegant little apartment, covered with tapestry, and lined with silk, pale blue and white, fluted with a crown overhead in the centre. The Commissioners and foreign ministers now made their way down to the entrance-hall, ready to pay their respects to her Majesty on her arrival (see Engraving). Exactly at ten minutes to twelve, the Queen and her Royal Consort, accompanied by the Prince of Wales and the Princess Royal, alighted from their carriage, and after repairing to the retiring room, proceeded to enter the magnificent edifice of the production of which his Royal Highness had been the chief promoter. The Queen wore a dress of pink satin, brocaded in gold; Prince Albert, a Field Marshal's uniform; the Prince of Wales, a Highland dress; and the Princess Royal, a white lace dress, with a wreath of flowers round her head. The Royal party, especially the young Prince and Princess, appeared much struck and delighted with the stately grandeur of the scene which burst upon their view.

As her Majesty and Prince Albert entered under the crystal arched roof, through the handsome bronzed and gilded northern gates erected by the Coalbrookdale Company, through the adjacent spaces decorated by gorgeous exotics, sparkling fountains, and choice statuary, and as the flourish of trumpet and clarion proclaimed this their State entry, a most deafening burst of applause came from the concourse of loyal subjects around her, who rose to welcome the Royal pair. The sight was overwhelmingly grand. When her Majesty had taken her seat in the chair of state—to which she was conducted through the Royal Commissioners, Foreign Ministers, and members of the Cabinet, who in their bright Court dresses and splendid uniforms were ranged around her chair—the national anthem, "God save the Queen," was performed by a choir of nearly a thousand voices, accompanied on the organ (built by Messrs. Gray and Davison) by Mr. Goss and Mr. Turle.

His Royal Highness Prince Albert having descended from the daïs, and taken his place with the other Commissioners read the following address:—

"May it please your Majesty,—We, the Commissioners appointed by your Majesty's Royal warrant of the 3rd of January, 1850, for the promotion of the Exhibition of the works of Industry of all Nations, and subsequently incorporated by your Majesty's Royal charter of the 15th of August in the same year, humbly beg leave, on the occasion of your Majesty's auspicious visit at the opening of the Exhibition, to lay before you a brief statement of our proceedings to the present time.

"By virtue of the authority graciously committed to us by your Majesty, we have made diligent inquiry into the matters which your Majesty was pleased to refer to us,—namely, into the best mode of introducing the productions of your Majesty's colonies and of foreign countries into this kingdom—the selection of the most desirable site for the Exhibition, the general conduct of the undertaking, and the proper method of determining the nature of the prizes, and of securing the most impartial distribution of them.

"In the prosecution of these inquiries, and in the discharge of the duties assigned to us by your Majesty's Royal charter of incorporation, we have held constant meetings of our whole body, and have, moreover, referred numerous questions connected with a great variety of subjects to committees composed partly of our own members, and partly of individuals distinguished in the several departments of science and the arts, who have cordially responded to our applications for their assistance at a great sacrifice of their valuable time.

"Among the earliest questions brought before us, was the important one as to the terms upon which articles offered for exhibition should be admitted into the Building. We considered that it was a main characteristic of the national undertaking in which we were engaged, that it should depend wholly upon the voluntary contributions of the people of this country for its success; and we therefore, decided, without hesitation, that no charge whatever should be made for the admission of such goods. We considered, also, that the office of selecting the articles to be sent should be entrusted, in the first instance, to local committees, to be established in every foreign country, and, in various districts of your Majesty's dominions, a general power of control being reserved to the commission.

"We have now the gratification of stating that our anticipations of support in this course have in all respects been fully realised. Your Majesty's most gracious donation to the funds of the Exhibition was the signal for voluntary contributions from all, even the humblest, classes of your subjects; and the funds which have thus been placed at our disposal amount at present to about 65,000*l*. Local committees, from which we have uniformly received the most zealous co-operation, were formed in all parts of the United Kingdom, in many of your Majesty's colonies, and in the territories of the Honourable East India Company. The most energetic support has also been received from the Governments of nearly all the countries in the world, in most of which commissions have been appointed for the special purpose of promoting the objects of an Exhibition justly characterised, in your Majesty's Royal warrant, as an Exhibition of the Works of Industry of all Nations.

"We have also to acknowledge the great readiness with which persons of all classes have come forward as exhibitors; and here again it becomes our duty to return our humble thanks to your Majesty, for the most gracious manner in which your Majesty has condescended to associate yourself with your subjects, by yourself contributing some valuable and interesting articles to the Exhibition.

"The number of exhibitors whose productions it has been found possible to accommodate is about 15,000, of whom nearly one-half are British. The remainder represent the productions of more than forty foreign countries, comprising almost the whole of the civilised nations of the globe. In arranging the space to be allotted to each, we have taken into consideration both the nature of its productions and the facilities of access to this country afforded by its geographical position. Your Majesty will find the productions of your Majesty's dominions arranged in the western portion of the Building, and those of foreign countries in the eastern. The Exhibition is divided into the four great classes of—1. Raw Materials; 2. Machinery; 3. Manufactures; and 4. Sculpture and the Fine Arts. A further division has been made according to the geographical position of the countries represented, those which lie within the warmer latitudes being placed near the centre of the Building, and the colder countries at the extremities.

"Your Majesty having been graciously pleased to grant a site in this, your Royal Park, for the purposes of the Exhibition, the first column of the structure, now honoured by your Majesty's presence, was fixed on the 26th of September last. Within the short period, therefore, of seven months, owing to the energy of the contractors, and the active industry of the workmen employed by them, a building has been erected, entirely novel in its construction, covering a space of more than 18 acres, measuring 1851 feet in length, and 456 feet in extreme breadth, and capable of containing 40,000 visitors, and affording a frontage for the exhibition of goods to the extent of more than ten miles. For the original suggestion of the principle of this structure, the Commissioners are indebted to Mr. Joseph Paxton, to whom they feel their acknowledgments to be justly due for this interesting feature of their undertaking.

"With regard to the distribution of rewards to deserving exhibitors, we have decided that they should be given in the form of medals, not with reference to merely individual competition, but as rewards for excellence in whatever shape it may present itself. The selection of the persons to be rewarded has been entrusted to juries composed equally of British subjects and of foreigners, the former having been selected by the commission from the recommendations made by the local committees, and the latter by the Governments of the foreign nations, the productions of which are exhibited. The names of these jurors, comprising as they do many of European celebrity, afford the best guarantee of the impartiality with which the rewards will be assigned.

"It affords us much gratification, that, notwithstanding the magnitude of this undertaking, and the great distances from which many of the articles now exhibited have had to be collected, the day on which your Majesty has been graciously pleased to be present at the inauguration of the Exhibition is the same day that was originally named for its opening, thus affording a proof of what may, under God's blessing, be accomplished by good-will and cordial co-operation amongst nations, aided by the means that modern science has placed at our command.

"Having thus briefly laid before your Majesty the results of our labours it now only remains for us to convey to your Majesty our dutiful and loyal acknowledgments of the support and encouragement which we have derived throughout the extensive and laborious task from the gracious favour and countenance of your Majesty. It is our heartfelt prayer that this undertaking, which has for its end the promotion of all branches of human industry, and the strengthening of the bonds of peace and friendship among all the nations of the earth, may, by the blessing of Divine Providence, conduce to the welfare of your Majesty's people, and be long remembered among the brightest circumstances of your Majesty's peaceful and happy reign."

To which her Majesty read the following gracious reply, which was put into her hands by Sir G. Grey:—

I receive with the greatest satisfaction the address which you have presented to me on the opening of this Exhibition.

"I have observed, with a warm and increasing interest, the progress of your proceedings in the execution of the duties entrusted to you by the Royal Commission; and it affords me sincere gratification to witness the successful result of your judicious and unremitting exertions in the splendid spectacle by which I am this day surrounded.

"I cordially concur with you in the prayer, that, by God's blessing, this undertaking may conduce to the welfare of my people, and to the common interests of the human race, by encouraging the arts of peace and industry, strengthening the bonds of union among the nations of the earth, and promoting a friendly and honourable rivalry in the useful exercise of those faculties which have been conferred by a beneficent Providence for the good and the happiness of mankind."

Prince Albert then returned to his place beside her Majesty on the daïs, and the Archbishop of Canterbury read the following prayer, or benediction, a breathless stillness pervading the vast assemblage:—

PRAYER.

"Almighty and everlasting God, governor of all things, without whom nothing is strong, nothing holy, accept, we beseech Thee, the sacrifice of our praise and thanksgiving, receive our prayers which we offer up to Thee this day, in behalf of this Kingdom and land. We acknowledge, O Lord, that Thou hast multiplied the blessings which Thou mightest most justly have withheld; we acknowledge that it is not because of the works of righteousness which we have done, but of Thy great mercy, that we are permitted to come before Thee this day with the voice of thanksgiving. Instead of humbling us for our offences, Thou hast given us just cause to praise Thee for Thine abundant goodness. And now, O Lord, we beseech Thee to bless the work which Thou hast enabled us to begin, and to regard with Thy favour our present purpose of uniting together in the bond of

vats containing a strong dye, red, green, or black, and the shank is next fixed in. The button is then placed in a mould, where the under surface is stamped with the maker's name. A dozen moulds are put into an iron box, and heated over an oven until the horn is as soft as wax, and then an upper mould with the pattern for the top of the button is pressed down, fitting close to the lower mould. The moulds having been placed in the press, and submitted to its action, the buttons are complete, except that the rough edges require paring. Brushes, worked by steam, then run over and polish the buttons, and they are ready for the sorter. There are numerous beautiful specimens of these buttons in the cases to which we shall presently refer.

There are still many other kinds of buttons to be noted. The pearl button gives employment to two thousand people in Birmingham alone.

We must not forget glass buttons, with which it was lately the pleasure of admiring mothers to sprinkle their little boys very profusely, and which are also much in demand for exportation to the African chiefs, who have the true barbarian love of glitter. There are two sorts, the round and the knob-shaped. The former are made of sheet-glass, of various colours, and coated with lead, which is cut by hand into small squares, the corners of which are rounded with scissors, and the edges are ground on a wheel. The shank is then fastened; it is joined to a round piece of zinc, the size of the button, and soldered to it. The knob buttons are made in a mould: a long rod of glass being softened in a furnace and clasped in the mould, in which the shank has previously been fitted. The black glass buttons, for coat links, are made at a lathe. Agate, cornelian, and stone buttons are imported from Bohemia, and shanked and finished in Birmingham.

There are several other kinds of buttons, as the iron and brass buttons with four holes, used for trowsers, steel buttons for ladies' dresses, woollen buttons and bone buttons for under clothing. The former are punched by one press, rendered concave by another, and pierced by a third, and then a hand piercer is introduced from the opposite side to that which receives the blow, in order to smooth the edges of the holes. Having been cleaned, the buttons receive a white coating, by means of a chemical process. The steel buttons are made by the steel toy manufacturers. The wood buttons are made by wood turners; and the bone buttons are chiefly made by the horn button makers.

Having thus enumerated the principal forms of button, we will pass in review some of the specimens exhibited. Messrs. Twigg (279, General Hardware) have some very handsome specimens of the "Jeames" button, and some boldly embossed naval buttons, with appropriate ornament. Some of their cut-glass buttons in metal are effective. Messrs. Pigott's (281) bronzed buttons, with sporting subjects, are among the best we have ever seen; and Messrs. Hammond (282) have some particularly bold and well-executed device buttons—a set which we noticed, as made for a "Curling Club," being very characteristic. Messrs. Aston (283) not only show a handsome assortment of all kinds, especially of the Florentine class, but they introduce a series designed to illustrate their manufacture—a course which is very much in conformity with the spirit of the Exhibition, and one which we could wish had been adopted wherever it was conveniently practicable. Messrs. Inman (284), have also some bold and well-executed buttons, some of them honoured with the episcopal *insignia*, and others for the servants of the London Docks. Some of the prettiest cut-glass buttons in the Exhibition are those of Messrs. Neal and Tonks (285); and Messrs. Chatwin's case (286) contains as highly-finished specimens as any assortment around them. In connexion with Mr. Banks's buttons (287), we observed some large and fine specimens of the shells used in the manufacture of pearl buttons, above described, which are brought from the Gulf of Persia, and from the Sooloo Isles. A very small but pretty contribution is made by Mr. Knowles (289), consisting of gold-plated and enamelled buttons—there are, we think, about a dozen only. Mr. Wells (290) exhibits some horn buttons of considerable merit. The case (295) contributed by Messrs. Smith, Kemp, and Wright shows us a very brilliant assortment. The sporting buttons, representing the neck-and-neck end of a race, the hunter clearing a hedge, the sportsman bringing down his partridge, with other varieties of amusement, are very cleverly designed. There is a good St. George and the Dragon, and indeed a very rich multiplicity of devices, enamels, crests, buildings, military and naval buttons, a capital lion, and other designs for ornamental buttons. Messrs. Allen and Moore (300), among many choice and beautiful articles in hardware, exhibit metal buttons of fine finish; and Mr. Aston (30) shows velvet buttons, which we marked as very rich in their effect. We have spoken of the manufacture of pearl buttons, and Messrs. Elliott (362) exhibit some with metallic rims—an arrangement which conveys the desirable idea of exceeding care in the finish. Messrs. Ingram (304) illustrate very fully the horn button in its history and varieties. Messrs. Heeley also (305) have some metal articles amid their beautiful hardware. Mr. Nash (310), a die sinker, shows the dies by which the metal buttons are stamped. In a case (364), exhibited by Mr. Brissrabb, are specimens of the mother-o'-pearl button, and among them of the black pearl.

The general characteristics of the specimens of button manufacture must, of course, be, to a great extent, similar, the contributions being chiefly sent by first-rate producers, who, in running an honourable race with their rivals, all attain the point of excellence which leaves little room for diversity. In some of the cases there is more artistic taste, as regards the designs of ornament, than in others; but the mechanical finish of the whole array defies censure. The button manufacture of England is obviously and decidedly creditable to the country.

HISTORY OF THE GREAT EXHIBITION.

V.—Opening of the Great Exhibition on the 1st of May.

On Thursday, the 1st of May—the day fixed upon from the very outset for the purpose—the Crystal Palace of Industry, in Hyde-park, was inaugurated by the Queen, accompanied by Prince Albert, the Prince of Wales, the Princess Royal, and many other branches of the Royal family, besides several foreign Princes, who had come over expressly to assist in the imposing ceremony. Further, in order to give increased importance to the occasion, to stamp it with the solemn adhesion of her Majesty's political advisers, the officers of State, both of the Government and of the household, attended upon her Majesty, forming a magnificent and glittering *cortége*.

Never dawned a brighter morn than on this ever-memorable "May-day," the sky clear and blue, the sun coming forth in undimmed splendour, the air crisp, cool, yet genial, as a poet's spring morn should be. London, with her countless thousands, was early afoot: by six o'clock, the hour fixed for opening the park-gates, streams of carriages, all filled with gaily-attired company, came pouring in from all parts of the metropolis and the surrounding districts, while whole masses of pedestrians marched in mighty phalanx towards the scene of action. All St. James's Park, all the way up Constitution Hill, all the way along Knightsbridge and Rotten-row, was one sea of heads, whose owners were all intent upon one object—to catch a glimpse of her Majesty and splendid suite on her way to the Palace of Industry. The line of route was kept by the Horse Guards and the police, who, we are glad to add, appeared to have experienced little difficulty in preserving order, whilst they interfered as little as possible with the pleasurable enjoyment and freedom of action of the multitude—so fully did all appear animated with the one desire to signalise this truly popular ceremonial with generous and kindly feeling, and a respect for the rights and duties of one another.

The only houses from which a sight could be got of the procession were those in Grosvenor-place and at Hyde Park Corner; and these were crowded with well-dressed persons, chiefly ladies, even to the very roofs. The roof of Apsley House was fully tenanted after this fashion, so was also that of the park-keeper's lodge; and at this point, when the procession emerged from the triumphal arch at the top of Constitution-hill, the cheering, which had been enthusiastic all along the line, rose into a shout which almost rent the air; whilst hats and handkerchiefs were waved from every hand.

The windows of the new front of Buckingham Palace were also filled with eager spectators of this portion of the day's proceedings, consisting chiefly of persons attached to the Royal household; the centre balcony being occupied by the younger Princes and Princesses, attended by several ladies.

Precisely at eleven o'clock the Horse Guards commenced widening the path for the procession; and at half-past eleven, the band of the regiment playing "God save the Queen," the Royal *cortége* set forth, in presence of a vast multitude, who cheered with unmistakeable heartiness—a greeting which her Majesty and her Royal consort acknowledged by repeatedly bowing, smiling all the while with undisguised satisfaction.

The Royal procession consisted of eight carriages, the coachmen and footmen all in their state liveries. It was, however, in its order, in many respects different from the state processions with which we are all familiar on the occasions of opening or proroguing a session of Parliament. We saw none of the Gentlemen Ushers, none of the Exons and Yeomen of the Guard. And, as the most important distinction, the carriages, even that of her Majesty, were drawn by a pair of horses each. Her Majesty's carriage was not the large uncomfortable-looking "glass coach," but a "dress carriage;" sufficiently open, however, to enable most of her subjects to see her to advantage. The occupants of the other carriages were the Lords and Ladies in Waiting, the Lords of the Household, the Maids of Honour, with some of the ladies of the suite of the Princess of Prussia.

The carriages were driven at a rather smart trot along the route, and thus curiosity was not so perfectly satisfied as at other times, when Royalty in state presents itself in public.

At a quarter to twelve o'clock the Royal procession reached the northern entrance of the Crystal Palace, the band stationed there striking up "God save the Queen," whilst a salute was fired from a battery prepared on the north or further side of the Serpentine, the martial noise of which, however, was drowned in the more heart-inspiring acclamations of thousands of Queen Victoria's peaceful and peace-loving subjects.

At the moment her Majesty entered the building of the Exhibition, the Royal standard was displayed from a staff erected at the top of the extreme end of the northern transept, which floated proudly above the hundred and one flags, of all nations, with which the exterior of the building had from an early hour in the morning been dressed.

Before closing our account of the out-of-doors proceedings of the day, we should state that at eight o'clock most of the metropolitan churches sent forth a merry peal; the union-jack being at the same time hoisted from their steeples.

peace and concord the different nations of the earth; for of Thee, O Lord, and not of the preparation of man, it cometh that violence is not heard in our land, nor contentions, nor violence within our borders. It is of Thee, O Lord, that nation does not lift up sword against nation, nor learn war any more. It is of Thee that peace is within our walls, plenteousness within our palaces, and men go forth in safety, and that knowledge is increased throughout the world. Therefore, O Lord, not unto us, but unto Thy name, be all praise. Whilst we survey the works of art and industry which surround us, let not our hearts be lifted up that we forget the Lord our God, or that it is not of our own power, or of the might of our hands, that we have gotten in this wealth. Teach us to remember that this store which we have prepared is all Thine own. In Thine hand it is to make great and give strength and honour. We thank Thee, we praise Thee, we entreat Thee to overrule this assembly of many nations, that it may tend to the advancement of Thy glory, to the increase of our prosperity, and to the promotion of peace and good-will among the different races of mankind. Let the many mercies we have received dispose our hearts to serve Thee more and more, who art the author and giver of all good things. Teach us to use these earthly blessings that Thou hast given us so richly to enjoy, that they may not withdraw our affections from those heavenly things which Thou hast prepared for them that love Thee through the merits and mediation of Thy Son Jesus Christ, to whom, with Thee and the Holy Ghost, be all honour and glory, world without end. Amen."

The "Hallelujah Chorus" then followed, by the choir, under the direction of Sir H. R. Bishop, accompanied on the organ by Drs. Elvey and Wylde.

The Royal procession was then formed in the following order:—

Heralds.

Architect, Joseph Paxton, Esq. Contractor, Mr. Fox.

Superintendents of the Works—C. H. Wild, Esq.; Owen Jones, Esq.

Financial Officer, F. H. Carpenter, Esq.

Members of the Building Committee—I. K. Brunel, Esq.; Charles Cockerell, Esq.; Professor Donaldson.

Members of the Finance Committee—Samuel Peto, Esq.; Sir Alexander Spearman, Bart.

Treasurers—Baron Lionel de Rothschild, William Cotton, Esq.; Sir John William Lubbock, Bart.; Arthur Kett Barclay, Esq.

Secretary to the Executive Committee, Matthew Digby Wyatt, Esq.

Executive Committee—George Drew, Esq.; Francis Fuller, Esq.; Charles Wentworth, Dilke, jun., Esq.; Henry Cole, Esq.; Lt.-Col. William Reid, Rl. Engineers, C.B.

FOREIGN ACTING COMMISSIONERS.

Austria—M. C. Buschek, Chevalier de Burg.
Bavaria—Professor Dr. Schafhault, M. Theobald Boehm, M. Haindl.
Belgium—M. Charles Cayllts, M. de Brouckeu.
Denmark—Regnar Westenholz.
France—M. Sallandrouze de Lamornaix.
Grand Duchy of Hesse—M. Rossler.
Greece—M. Ralli.
Hanse Towns—M. Piglheim.
Holland—M. Goothens, M. J. P. Dudok van Hal.
Northern Germany—M. Noback.
Portugal—M. F. J. Vanzeller, M. Antonio Valdez.
Prussia—Baron Hebeler.
Rome—Signor Carlo Tribbi.
Russia—M. Gabriel Kamensky.
Sardinia—Chevalier Leneisa.
Saxony—Dr. Seyffarth, LL.D.; M. Gustavus Dorstling.
Spain—M. Manuel de Ysasi, M. Ramon de la Sagra, M. Ramon de Echevarria.
Sweden and Norway—M. Chas. Tottie.
Switzerland—Dr. Bolley, M. Eichholzer.
Tunis—Signor Hamda Elmkaddem, M. Santillana (interpreter and secretary).
Turkey—M. Edward Zohrab.
Tuscany—Dr. Corridi.
United States—Mr. Edward Riddle, Mr. N. S. Dodge (secretary).
Wurtemburg—Mr. C. Brand.
Zollverein—M. Burath Stein.

Secretaries to the Royal Commission—Edgar A. Bowring, Esq.; Sir Stafford H. Northcote, Bart.; J. Scott Russell, Esq.

Special Commissioners—Dr. Lyon Playfair, Lieut.-Colonel Lloyd.

HER MAJESTY'S COMMISSIONERS.

Mr. Alderman Thompson.	John Gott, Esq.	Earl Granville.
R. Stephenson, Esq.	Wm. Cubitt, Esq.	Earl of Rosse.
Wm. Hopkins, Esq.	Thomas Bazley, Esq.	Sir C. L. Eastlake.
T. F. Gibson, Esq.	Thomas Baring, Esq.	Rt. Hon. W. E. Gladstone.
Richard Cobden, Esq.	Sir Charles Lyell.	Lord John Russell.
Charles Barry, Esq.	Sir R. Westmacott.	Lord Stanley.
John Shepherd, Esq.	Rt. Hon. H. Labouchere.	Earl of Ellesmere.
Philip Pusey, Esq.	Lord Overstone.	Duke of Buccleuch.

Her Majesty's Master of the Ceremonies.

Foreign Ambassador and Ministers.

F.M. the Duke of Wellington, K.G., Commander-in-Chief. F. M. the Marquis of Anglesey, K.G. Master-General of the Ordnance.

Her Majesty's Ministers.

His Grace the Archbishop of Canterbury.

White Wands; viz., Comptroller of the Household.

Treasurer of the Household.

Vice-Chamberlain.

Lord Steward. Lord Chamberlain.

Garter Principal King of Arms.

His Royal Highness Prince Albert, leading her Royal Highness the Princess Royal.

The Queen, leading his Royal Highness the Prince of Wales.

His Royal Highness the Prince of Prussia.

Her Royal Highness the Duchess of Kent.

His Royal Highness Prince Henry of the Netherlands.

Her Royal Highness the Princess of Prussia.

His Royal Highness Prince Frederick William of Prussia.

Her Royal Highness Princess Mary of Cambridge.

His Serene Highness Prince Edward of Saxe-Weimar.

His Royal Highness the Duke of Cambridge.

Mistress of the Robes.

Lady of the Bedchamber, Marchioness of Douro.

Lady of the Bedchamber in Waiting.

Maid of Honour in Waiting. Maid of Honour in Waiting.

Bedchamber Woman in Waiting. Lady Superintendent, Lady Caroline Barrington.

Foreign Ladies, and Lady in attendance on H.R.H. the Duchess of Kent.

Gold Stick in Waiting. Master of the Horse.

Groom of the Stole to H.R.H. Prince Albert.

Captain of the Yeoman of the Guard. Captain of the Gentlemen at Arms.

Master of the Buckhounds.

Lord of the Bedchamber to H.R.H. Prince Albert in Waiting. Lord in Waiting to the Queen.

Groom of the Bedchamber to H.R.H. Prince Albert in Waiting. Groom in Waiting to the Queen.

Clerk Marshal.

Equerry to H.R.H. Prince Albert in Waiting. Equerry to the Queen in Waiting.

Gentleman Usher [illegible] Gentleman Usher [illegible] Sword of State [illegible]

Silver Stick in Waiting. Field Officer of Brigade in Waiting.

The Gentlemen in attendance upon their Royal Highnesses the Duchess of Kent, the Duke of Cambridge, and the Prince and Princess of Prussia.

[illegible]

The Royal procession went up to the [illegible] end of the nave by its north side, returning to the east end of the nave by its south side, including the south end of the transept; and committed [illegible] along the [illegible] side of the nave, all present were thus excellently well enabled to see her Majesty and the procession.

During the procession, and at the Queen's approach, the organs in the British division, built by Messrs. Willis, Walker, and Hill of London, and those by foreign importers, Du Croquet (Paris) and Schulze (Erfurt), were successively played.

On her Majesty's return to the platform, the Queen declared "the Exhibition opened!" which was announced to the public by a flourish of trumpets and the firing of a Royal salute on the north of the Serpentine. The barriers which had kept the nave clear, were then thrown open, and the public were allowed to circulate, which they by no means appeared disposed to do, as they were all crowding towards the glories of the transept.

Her Majesty then returned to Buckingham Palace by the route by which she came, and all the doors, which had been closed at half-past eleven o'clock, were again opened.

Throughout the whole of the Queen's traverse of the building, her face was wreathed with smiles and pleasant looks, and her Majesty evidently took a more than common interest in the brilliant spectacle which everywhere attracted her notice.

The ceremonial was one, it may be said, without precedent or rival. The homage paid by the Sovereign of the widest empire in the world to the industry and genius of both hemispheres, will not fill a page in history as a mean and unsubstantial pageant. While the race of man exists, this solemn and magnificent occasion will not readily fade away from his memory like the "baseless fabric of a vision;" it commenced an era in which the sons of toil shall receive honour and reward; and, in accordance with the spirit of the day, it stimulates the energies of man to conquer "fresh domains," and discover new faculties of nature and her products, for the well-being and use of his fellow-creatures.

We append the Programme of the Musical Performances:—

At the entrance of her Majesty a flourish of trumpets.

When her Majesty had taken her seat in the Chair of State, the National Anthem, "God save the Queen," was performed, under the direction of Sir George T. Smart, organist and composer to her Majesty's Chapel Royal, by the choirs of her Majesty's Chapel Royal, St. Paul's Cathedral, Westminster Abbey, St. George's Chapel, Windsor, some of the pupils of the Royal Academy of Music, with the chorus and part of the band of the Sacred Harmonic Society, and many other performers, both foreign and English. Accompanied on the organ (built by Messrs. Gray and Davison) by Goss, organist of St. Paul's Cathedral, and Mr. Turle, organist of Westminster Abbey.

After the Prayer by his Grace the Archbishop of Canterbury, the "Hallelujah Chorus" (Handel) was performed, under the direction of Sir Henry R. Bishop, the Professor of Music at Oxford; accompanied on the organ by Dr. G. Elvey, organist of St. George's Chapel, Windsor, and Dr. Wylde, Professor at the Royal Academy of Music.

During the Royal procession the organs (in the following order), built by Messrs. Willis, Walker, Hill—all of London; and the organs built by Messrs. Du Croquet (Paris) and Shulze (Erfurt), were played under the superintendence of Mr. W. Sterndale Bennett, by Dr. Wesley, organist of Winchester Cathedral; Mr. Hopkins, organist of the Temple Church; Mr. G. Cooper, organist of St. Sepulchre's Church; M. Danjou, organist of Notre Dame, Paris; and Mr. H. Smart, organist of St. Luke's Church Old-street.

When her Majesty had returned to the platform, and declared the Exhibition opened, a flourish of trumpets, and the national Anthem, "God save the Queen," was repeated.

VI.—Close of the Exhibition, 11th Oct.—Report on the Awards of Juries, 15th Oct.

The Great Exhibition having been open to the public 141 days, was finally closed on the 11th October. The only incident which marked the event, was the striking up, at five o'clock, of the National Anthem by all the organs, accompanied by many voices in all parts of the crowded avenues. On Monday and Tuesday, the 13th and 14th, the Crystal Palace was thrown open to exhibitors and their friends, who were admitted by tickets without charge; and on Wednesday the 15th, the history of the Great Exhibition 1851 was brought to a final close, with a slight business-like ceremony, in which Prince Albert, as the President, received the reports of the juries, and addressed a speech in reply. This ceremony took place upon a temporary daïs in the middle of the transept, (the Crystal Fountain having

been previously removed), and the whole building was crowded with exhibitors and others admitted by tickets. We shall confine ourselves in this sketch to the principal points practically bearing upon the results of the Exhibition.

Viscount Canning, President of the Council and Chairman of Juries, read a report, in the course of which he described the constitution of the Juries, and the principles by which they had been guided in the distribution of prizes and awards:—

"The various subjects included in the Exhibition were divided, in the first instance, into thirty classes. Of these, two were subsequently found to embrace fields of action too large for single juries, and were therefore divided into sub-juries. This increased the number of acting juries to thirty-four.

"Each of these thirty-four juries consisted of an equal number of British subjects and of foreigners. The British jurors were selected by her Majesty's Commissioners from lists furnished by the local committees of the various towns, each town being invited to recommend persons of skill and information in the manufactures or produce for which it is remarkable. The foreign jurors were appointed by authorities in their own countries, in such relative proportion amongst themselves as was agreed upon by the foreign commissioners sent here to represent their respective Governments.

"In the event of a jury finding themselves deficient in technical knowledge of any article submitted to them, they were empowered to call in the aid of associates. These associates, who acted as advisers only, without a vote, but whose services were of the greatest value, were selected either from the jurymen of other classes, or from the lists of persons who had been recommended as jurors, but who had not been permanently appointed to any jury.

"Each jury was superintended by a chairman, chosen from its number by her Majesty's Commissioners. The deputy-chairman and the reporter were elected by the jurors themselves.

"Such was the constitution of the thirty-four juries taken singly. They did not, however, act independently of each other, inasmuch as they were associated into six groups, each group consisting of such juries as had to deal with subjects in some degree of kindred nature; and before any decision of a jury could be considered as final, it was required that it should be brought before the assembled group of which that jury formed a part, and that it should be approved by them.

"The chief object of this provision was that none of the many foreign nations taking part in the Exhibition should incur the risk of seeing its interests overlooked or neglected from the accident (an unavoidable one in many instances) of its being unrepresented in any particular jury.

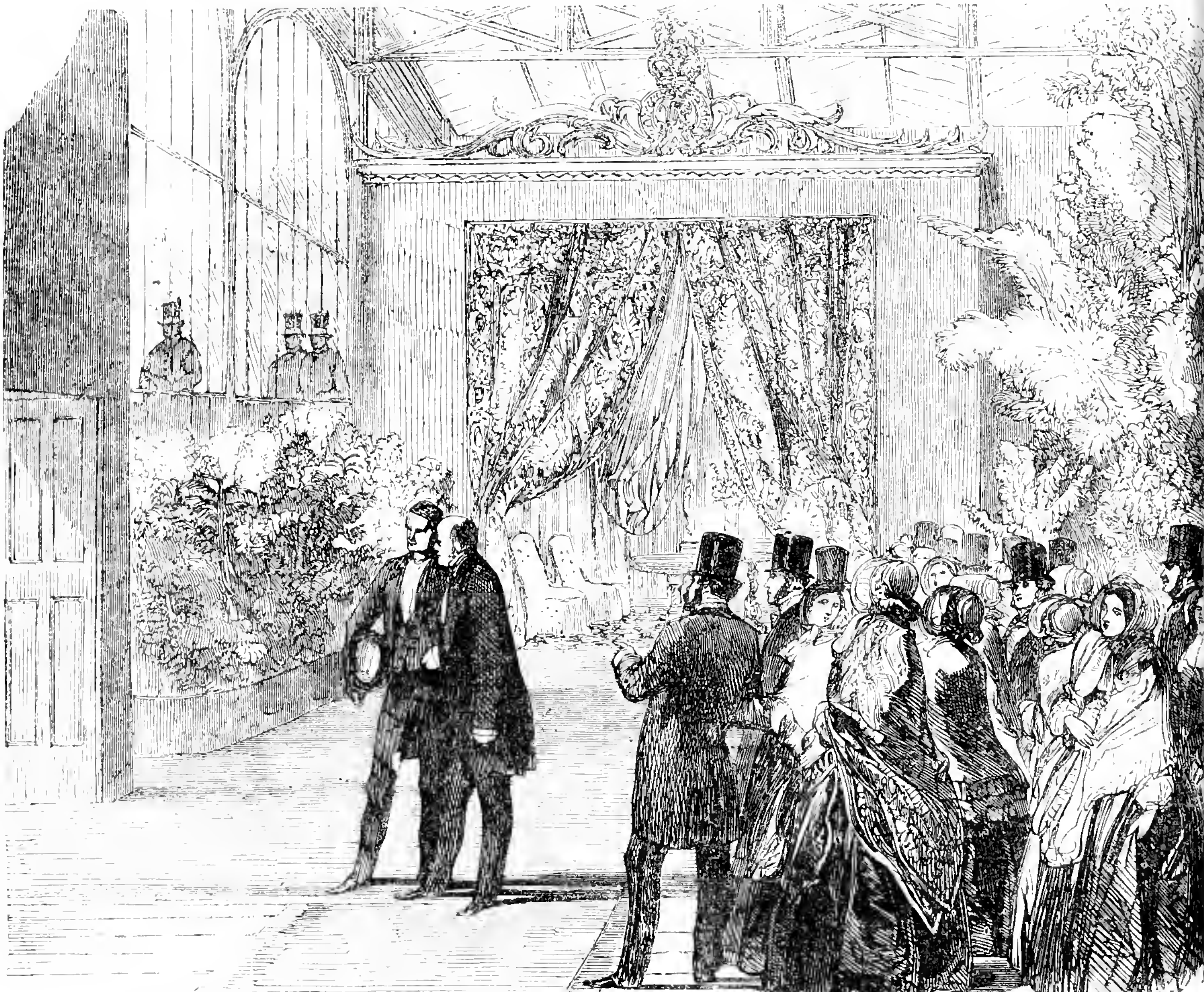
"Each group of juries received the assistance of a deputy-commissioner, and of a special commissioner, appointed by her Majesty's Commissioners to record its proceedings, to furnish information respecting the arrangements of the Exhibition, and otherwise to facilitate the labours of the juries composing the group.

"It was further determined by her Majesty's Commissioners that the chairmen of the juries, consisting of British subjects and of foreigners in equal numbers, should be formed into a council; and that the duties of the council should be to determine the conditions upon which, in accordance with certain general principles previously laid down by her Majesty's Commissioners, the different prizes should be awarded; to frame rules to guide the working of the juries; and to secure, as far as possible, uniformity in the result of their proceedings.

"These are the most important features of the system upon which the jurors found themselves organised. I will now refer briefly to their course of action.

"The council of chairmen, in proceeding to the discharge of their duties, were met at the outset by a serious difficulty. Her Majesty's Commissioners had expressed themselves desirous that merit should be rewarded wherever it presented itself, but anxious at the same time to avoid the recognition of competition between individual exhibitors. They had also decided that the prizes should consist of three medals of different sizes; and that these should be awarded, not as first, second, and third in degree for the same class of subjects and merit, but as marking merit of different kinds and character.

"The council of chairmen found, to their regret, that it would be impossible to lay down any rules for the awarding of the three medals by which the appearance at least of denoting different degrees of success amongst exhibitors in the same branch of production could be avoided. Accordingly, after fully explaining their difficulty to her Majesty's Commissioners, they requested, as a course by which it might be materially diminished, that one of the medals might be withdrawn.



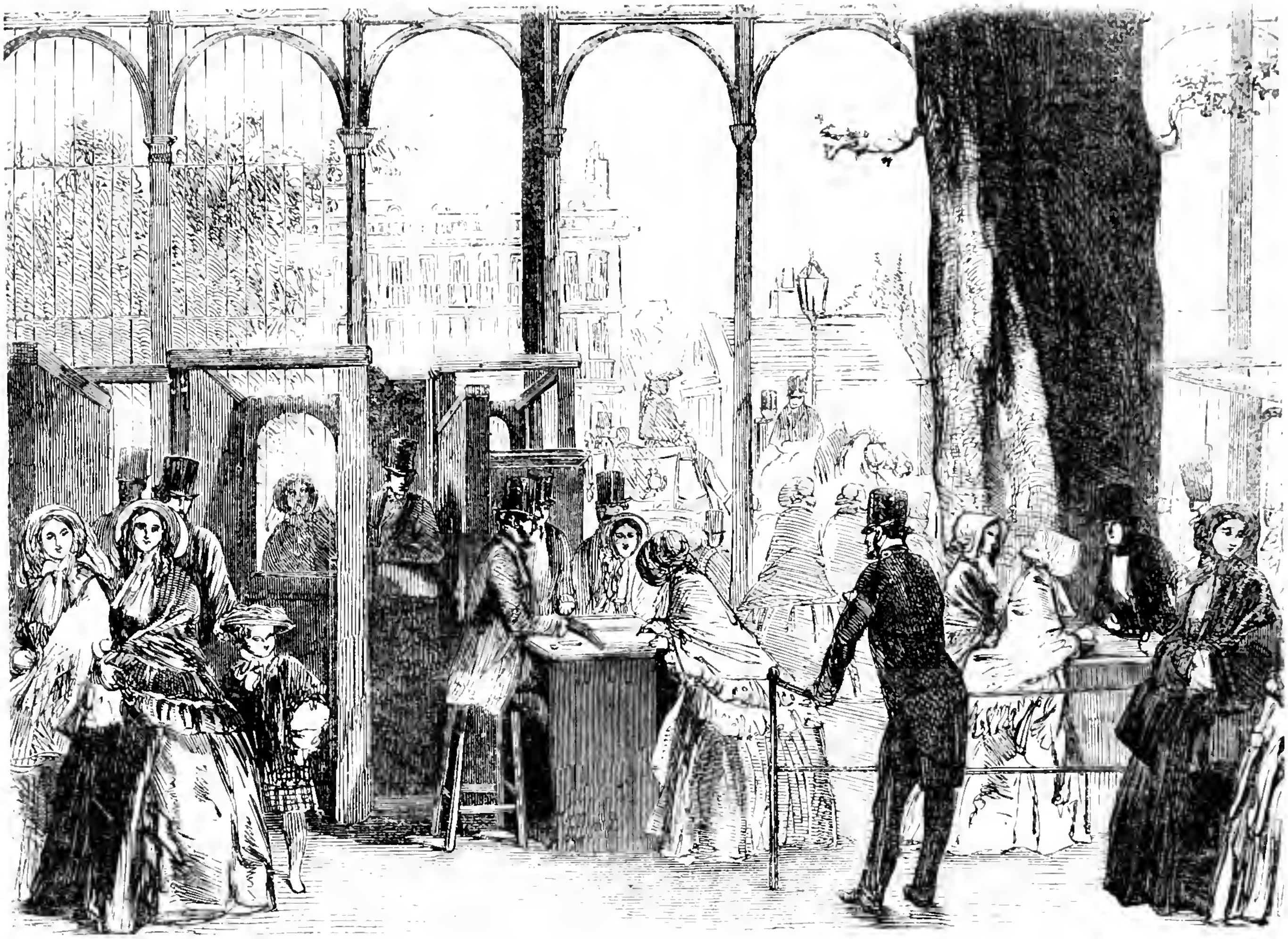
THE QUEEN'S WITHDRAWING-ROOM.—HER MAJESTY'S ARRIVAL AT THE NORTH ENTRANCE.

"Of the remaining two, they suggested that one, the prize medal, should be conferred wherever a certain standard of excellence in production or workmanship had been attained—utility, beauty, cheapness, adaptation to particular markets, and other elements of merit being taken into consideration according to the nature of the object; and they recommended that this medal should be awarded by the juries, subject to confirmation by the groups.

"In regard to the other and larger medal, they suggested that the conditions of its award should be some important novelty of invention, or application, either in material, or processes of manufacture, or originality combined with great beauty of design; but that it should not be conferred for excellence of production or workmanship alone, however eminent; and they further suggested that this medal should be awarded by the council of chairmen, upon the recommendation of a jury, supported by its group.

"The principle thus described met the views of her Majesty's Commissioners, and was subsequently further developed by them in a minute which they communicated to the council of chairmen. Its application, however, was not without difficulties, especially as regarded the foreign jurors. Many of these had taken part in the national exhibitions of France and Germany; and to them the distinctive character of the two medals, and the avoidance of all recognition of degrees of merit between the recipients of prizes, were prejudices and jealousies to have been expected to interfere with the decision; but the nature of the case presented many difficulties of a formidable character to the formation of a judgment which should appear satisfactory to all. The names of the jurors, indeed, when once made known, were of themselves a sufficient guarantee for that impartiality which was essential to the fulfilment of their task, and from all that has come to the knowledge of the Royal Commissioners during the progress of their labours, they are fully satisfied that every award has been made with the most careful consideration, after the most ample and laborious investigation, and upon grounds most strictly honourable, just, and candid.

"But although the high character of the jurors would have fully justified the Commissioners in entrusting them with the award of the prizes without fettering their discretion with any instructions whatever, had nothing more than an impartial decision been required, there were difficulties of a very peculiar nature inherent to the task, which seemed to render necessary the adoption of some regulations that might, at first sight, appear to have been somewhat arbitrary in their character. The differences in the wants of various nations having necessarily impressed their several manufactures with different chara-



THE SOUTH ENTRANCE, AS SEEN FROM THE INSIDE.

novel principles, and at variance with their experience; inasmuch as one of the chief purposes of the national exhibitions of the continent had been to distinguish the various degrees of success attained by rival exhibitors.

"It was to be expected, therefore, that cases would arise in which the council medal, as the higher reward, would be asked for exhibitors whose claims were only somewhat stronger in degree, without differing in kind from those of others to whom the prize medal had been awarded. In such cases it became the duty of the council of chairmen to refuse their sanction to the award of the council medal; without, however, necessarily impugning the alleged superiority of the article for which it was demanded. On the other hand, some instances have occurred in which they have felt themselves called upon to confirm the claim to a council medal where the object for which it was claimed showed in itself less merit of execution or manufacture than others of its class. It follows, therefore, that the award of a council medal does not necessarily stamp its recipient as a better manufacturer or producer than others who have received the prize medal. It is rather a mark of such invention, ingenuity, or originality as may be expected to exercise an influence upon industry more extended, and more important, than could be produced by mere excellence of manufacture."

Prince Albert in his reply, after thanking the Jurors for their services, said:—

"In no department of the vast undertaking, which has just been brought to a happy close, were greater difficulties to have been apprehended than in that in which your lordship and your eminent colleagues have given your assistance. On this, the first occasion on which the productions of the different nations of the globe have ever been brought together for the purpose of comparing their several merits, not only were teristics, it would seem to be almost impossible for those who have been in the habit of judging the productions of their own country by one standard, to enter fully into merits which can only be properly appreciated by another standard, since the very points which in the one case appear to be excellencies, may in the other, not unnaturally, be taken as defects. This consideration, and a knowledge of the evils which were to be apprehended from any accidentally erroneous decision, in a matter so intimately connected with the commercial interests of every nation, induced the Royal Commissioners to lay down, for the guidance of the juries, those principles to which your lordship has referred.

"It would perhaps have been more interesting to the public had the Commissioners instructed the juries to follow the practice which has usually prevailed in the exhibitions of individual nations, and to grant medals of different degrees, to mark the gradations of excellence among the exhibitors; but they feel that they have adopted the safer course, and that which was upon the whole most in accordance with the feelings of the majority of the exhibitors, in directing that no distinction should be made between their merits if their productions came up to the standard requisite to entitle them to a prize, but that all should without exception take the same rank and receive the same medal.

"The Commissioners, however, considered it right to place at the disposal of the council of chairmen a peculiar or 'council' medal in the cases to which your lordship has referred. Important discoveries in many branches of science and of manufactures have in this Exhibition been brought under the notice of the public; and it seems just that those who have rendered services of this kind to the world should receive a special mark of acknowledgment on an occasion which has rendered so conspicuous the advantages which the many have derived from the discoveries of the few.

"The grant of the council medal for beauty of design, and for excellence in the fine arts, as applied to manufactures, though made upon a somewhat different principle, is also compatible with the views of the Commissioners, since in the cases in which it has been given it does not mark any greater comparative excellence of manufacture, or assign to

one producer a higher place than is accorded to others, but is to be regarded as a testimony to the genius which can clothe the articles required for the use of daily life with beauty that can please the eye and instruct and elevate the mind. Valuable as this Exhibition has proved in many respects, it appears to the Commissioners that there is no direction in which its effects will be more sensibly and immediately perceived than in the improvement which it may be expected to produce in taste, and the impulse it has given to the arts of design; and a special acknowledgment is justly due to those who have afforded the best examples of art, whether pure or applied, and led the way in this interesting career of improvement.'

His Royal Highness then, again, on behalf of the Commissioners thanked the Jurors as a body, the Foreign Commissioners, and the Sectional and Local Committees, adding;—

"And finally, we cannot forget that all the labours of those thus officially connected with the Exhibition would have been in vain, had it not been for the hearty good will and assistance of the whole body of exhibitors, both Foreign and British. The zeal which they have displayed in affording a worthy illustration of the state of the industry of the nations to which they belong, can only be equalled by the successful efforts of their industrial skill. The Commission have always had support and encouragement from them during the progress of the undertaking, and they cannot forget how cheerfully they submitted to regulations essential for their general good, although sometimes producing personal inconvenience to themselves. If the Exhibition be successful in aiding the healthy progress of manufactures, we trust their efforts will meet with a due reward."

The National Anthem was then sung; after which the Bishop of London read a prayer of thanksgiving. This was followed by the Hallelujah Chorus, at the close of which the Prince and Commissioners left the platform, and the business of the day terminated.

ANALYSIS OF THE AWARDS.

An examination of the aggregate result of the labours of the jurors shows that the number of awards of all classes—council and prize medals, and "honourable mentions"—is 5084; of this number 2039 have been awarded to the United Kingdom, and 3045 to the foreign exhibitors. Upon analyzing these lists, we find that the proportion of prizes awarded in the six great groups which included the whole of the jurors is as follows:—

RAW MATERIALS.—CLASSES I. TO IV.

	British.	Foreign.	Total.
Council medals	6	16	22
Prize medals	125	457	582
Honourable mentions	131	535	666
Total	[illegible]	[illegible]	1250

MACHINERY.—CLASSES V. TO X.

	British.	Foreign.	Total.
Council medals	52	36	88
Prize medals	301	191	492
Honourable mentions	51	114	165
Total	404	341	745

TEXTILE FABRICS.—CLASSES XI. TO XX.

	British.	Foreign.	Total.
Council medals	1	2	3
Prize medals	[illegible]	498	[illegible]
Honourable mentions	[illegible]	277	[illegible]
Total	523	777	1300

METALLIC, VITREOUS, AND CERAMIC MANUFACTURES.—CLASSES XXI. TO XXV.

	British.	Foreign.	Total.
Council medals	14	21	35
Prize medals	312	214	526
Honourable mentions	208	199	407
Total	534	434	968

MISCELLANEOUS MANUFACTURES.—CLASSES XXVI. TO XXIX.

	British.	Foreign.	Total.
Council medals	1	10	11
Prize medals	142	232	374
Honourable mentions	[illegible]	151	[illegible]
Total	[illegible]	[illegible]	[illegible]

FINE ARTS.

	British.	Foreign.	Total.
Council medals	2	2	4
Prize medals	27	60	87
Honourable mentions	41	47	88
Total	70	109	179

We shall make some observations upon the awards, and the nature of the objects to which they refer, in future articles. Besides the medals the Jurors have, in a few special cases, granted money awards, of which the following is a list:—

MONEY AWARDS.

Alex. [illegible], United Kingdom—for having exhibited a complete set of [illegible] nets, lines, and hooks, for deep sea fishing—50*l*.

— Joseph [illegible], United Kingdom—for having exhibited models of his improvements in the construction of blocks, combining strength and other advantages with much less weight—50*l*.

1[illegible] [illegible], United Kingdom—for having exhibited a model of the "Victoria and Albert" yacht, executed by him—being a fine specimen of workmanship—50*l*.

171 — [illegible], United Kingdom—for an ingenious system of signals for [illegible]—20*l*.

468 G. F. Greiner, United Kingdom—for his new and useful method of bringing into unison the strings of each choir of the pianoforte, also for his invention of a new and mechanical contrivance for pianos, combining the advantage of Erard's machine, with greater construction and durability—50*l*.

— J. S. Wood, United States—for the expenses incurred in constructing his piano violin—50*l*.

101 F. Retor, Switzerland—to enable him to carry on further experiments to test the isochronism of spirals, his invention of a new and ingenious free spring escapement being particularly adapted for that purpose—50*l*.

NOTE.—*The Jury award the sum of 10l. each to the following subjects.*

106 Ann Harvey (Belfast), United Kingdom—hand-spun flax-yarn.

546 Hempen Spinning School (for a little girl 10 years of age), Prussia—spun flax-yarn.

— Jane McGill (Belfast), United Kingdom—hand-spun flax-yarn.

237 J. Lamford, United Kingdom—fine light gauze flannels.

97 E. Budden, United Kingdom—the workman who bound an album, very elaborately ornamented, in which taste and good work are displayed.

91 R. Niel, United Kingdom—for the care, industry, and perseverance displayed in binding an imperial 4to. Bible in cream Morocco, under great disadvantages: the work was executed at his own home after his daily occupation, by gas light in the winter; and notwithstanding these difficulties, a considerable degree of excellence is attained.

STATISTICS OF THE EXHIBITION.

NUMBER OF VISITORS.

In the month of May the number of visitors was	734,782
In June	1,133,116
In July	1,314,176
In August	1,023,435
In September	1,155,240
In October, up to the 11th instant	841,107
Grand total	6,201,856

The total receipts were as follows, up to the close of the Exhibition:—

Public subscriptions	£64,344 0 0
Privilege of Printing	3,200 0 0
Privilege of supplying refreshments	5,500 0 0
Amount received for season tickets up to 1st of May	40,000 0 0
Royalty of 2*d.* per copy on catalogues	
Total funds in hand on the 1st of May	£113,044 0 0
Amount received at the doors up to August 30	252,141 9 6
Ditto up to the end of September	62,007 12 0
Ditto up to Saturday, October 11	41,922 11 6
Grand total	£469,115 13 0

CURIOUS FACTS CONNECTED WITH THE EXHIBITION.

Of the money received at the doors, 275,000*l.* was in silver, and 81,000*l.* in gold. The weight of the silver coin so taken (at the rate of 28lb. per 100*l.*) would be 35 tons, and its bulk 900 cubic feet! The rapid flow of the coin into the hands of the money-takers prevented all examination of each piece as it was received, and 90*l.* of bad silver was taken, but only one piece of bad gold, and that was a half-sovereign. The half-crown was the most usual bad coin, but a much more noticeable fact is, that nearly all the bad money was taken on the half-crown and five shilling days. The cash was received by eighteen money-takers: on the very heavy days six extra ones being employed during the busiest hours. From them it was gathered by three or four money-porters, who carried it to four collectors, charged with the task of counting it. From them it went to two tellers, who verified the sums, and handed it to the final custody of the chief financial officer, Mr. Carpenter, who locked each day's amount in his peculiar iron chests in the building till next morning, when in boxes, each holding 600*l.*, it was borne off in a hackney cab in charge of a Bank of England clerk and a Bank porter. The money was received in all forms, ranging between farthings and ten-pound notes. Contrary to the notices exhibited, change was given. Occasionally foreigners gave Napoleons, and these coins being mistaken for sovereigns, they received nineteen shillings out, and liberty of admission into the bargain. The monies of America, Hamburg, Germany, and France, were often tendered and taken. The total number of visitors from the 1st of May to the 11th of October was 6,063,986.

COLLECTION OF SPECIMENS FOR FOREIGN NATIONS.—The following circular has just been issued to the British Exhibitors:—"Many of the foreign Acting Commissioners having represented that international advantages would be likely to arise if their countries possessed a collection of specimens of raw materials and produce, and patterns of some classes of manufactures shown by British exhibitors, together with the wholesale prices of them; and having expressed a desire that such collection should be formed, her Majesty's Commissioners have authorised the Executive Committee to assist in forming them. British exhibitors, who may be willing to present specimens and patterns for this purpose, are requested to communicate immediately with Lieutenant Tyler, R.E.; but in those cases where they may not consider such presentations to be a sufficient commercial advantage to themselves, the Executive Committee are authorised to treat for the purchase of the necessary qualities; and exhibitors are requested to forward their terms for the purchase to Lieutenant Tyler before removing their articles from the building.—M. Digby Wyatt, secretary, Exhibition building, Oct. 11th."

LITERATURE OF THE GREAT EXHIBITION.

THE GREAT EXHIBITION AND ITS RESULTS.

(FROM THE ILLUSTRATED LONDON NEWS, OCT. 11.)

THE Great Exhibition of the Industry of all Nations closes to-day. In the course of a few weeks the most extensive assemblage of valuable products in all branches of manufacture ever brought together under one roof will be scattered and dispersed, and the Great Industrial Congress of 1851 will be numbered with the memorable events of the past.

But its influence will not cease here; it is but the first act of an important social movement, upon which the curtain is about to fall; and who shall say that what is to follow may not go far to realise the profound and philanthropic aspirations of the Prince Consort, the projector and ruling genius of the whole scheme, in the memorable words uttered by him at a banquet given by the Lord Mayor in 1849?

"I conceive it to be the duty of every educated person closely to watch and study the time in which he lives; and, as far as in him lies, to add his humble mite of individual exertion to further the accomplishment of what he believes Providence to have ordained. Nobody, however, who has paid any attention to the particular features of our present era, will doubt for a moment that we are living at a period of most wonderful transition, which tends rapidly to the accomplishment of that great end to which, indeed, all history points—the realisation of the unity of mankind. Not an unity which breaks down the limits, and levels the peculiar characteristics of the different nations of the earth, but rather a unity the result and product of those very national varieties and antagonistic qualities. The distances which separated the different nations and parts of the globe are gradually vanishing before the achievements of modern invention, and we can traverse them with incredible ease: the languages of all nations are known, and their acquirements placed within the reach of everybody; thought is communicated with the rapidity and even by the power of lightning. On the other hand, the great principle of division of labour, which may be called the moving power of civilisation, is being extended to all branches of science, industry, and art. Whilst formerly the greatest mental energies strove at universal knowledge, and that knowledge was confined to the few, now they are directed to specialities, and in these again even to the minutest points; but the knowledge acquired becomes at once the property of the community at large. Whilst formerly discovery was wrapt in secrecy, the publicity of the present day causes, that no sooner is a discovery or invention made, than it is already improved upon and surpassed by competing efforts; the products of all quarters of the globe are placed at our disposal, and we have only to choose which is the best and cheapest for our purposes, and the powers of production are intrusted to the stimulus of competition and capital. So man is approaching a more complete fulfilment of that great and sacred mission which he has to perform in this world. His reason being created after the image of God, he has to use it to discover the laws by which the Almighty governs his creation, and, by making these laws his standard of action, to conquer nature to his use—himself a divine instrument. Science discovers these laws of power, motion, and transformation: industry applies them to the raw matter, which the earth yields us in abundance; but which becomes valuable only by knowledge: art teaches us the immutable laws of beauty and symmetry, and gives to our productions forms in accordance with them. Gentlemen, the Exhibition of 1851 is to give us a true test and a living picture of the point of development at which the whole of mankind have arrived in this great task, and a new starting point from which all nations will be able to direct their further exertions."

Looking back upon the experience of the two years since these views were propounded; looking back more particularly upon the six months which have elapsed since the Great Exhibition was completed and thrown open, we are inclined to think there is little if any exaggeration in the hopeful picture of the world's future which is thus shadowed forth, as capable of accomplishment by the right direction of the natural gifts and means at the disposal of the great human family. If no more has been accomplished as yet, the very crowding in of goods from all quarters of the globe, and the thronging in of millions of spectators, interested more or less in the production or uses of those commodities, afford a striking proof of the unanimity which prevails amongst men upon any comprehensive scheme of true usefulness, and their power to carry it into accomplishment.

This great feature also distinguishes the Peace Congress of 1851 from all known political congresses or movements of nations—that whereas, in the one case the gain of one is under almost all circumstances obtained by a concession or sacrifice of interests on the part of some other, and that generally the weaker one; in the other, gain is gain to all, the superiority of means or appliance evidenced by each competitor being at once available to the advantage of all the rest. The achievements of human intellect are common property, and only require to be known to be at once applied, in combination with others, to the attainment of still greater achievements.

It cannot be doubted that the success of the Great Exhibition has far exceeded the most sanguine expectations of its projectors; and but that it was a gathering together for good, they might almost, like another Frankenstein, have been terrified at the vast army of [illegible] of various races and habits, which they had been the means of congregating around the wealthiest and [illegible] capital in the world. It is curious, indeed, to look back at a few of the past circumstances of this great drama, and to see how the anticipations of the directors of it have been disappointed; but [illegible], and we mention them merely as curiosities of history. When, after [illegible] and much canvassing for subscriptions throughout the country, the Royal Commission was formed, and incorporated by charter, its first act was to rescind a contract optionally open to them with Messrs. Munday, by which all risk or liability upon pecuniary grounds would have been avoided, thus "resting the success of the proposed experiment entirely upon public sympathy." This step probably alarmed the Executive Committee; it seemed at least to them to render the issue problematical, and they immediately, in a body, tendered their resignations. "These resignations," Mr. Cole says, in his Introduction to the Official Catalogue, "were not accepted, and some time elapsed before the executive arrangements were conclusively modified to meet the altered circumstances of the case." Again, when the guarantee fund had been subscribed, and the Crystal Palace was on the eve of completion, Mr. Paxton, doubtless with the assent of others engaged in the anxious undertaking (for the step was not disavowed by them), published a letter to the Prime Minister, urging him to adopt the work on behalf of the public; that is, to pay the expenses out of the Consolidated Fund, and throw the doors open gratuitously, as at the Museum and other public institutions. This proposition was fortunately not acceded to; and nearly half a million of money in voluntary contributions at the doors—the greater part in shillings—has justified the refusal, and given convincing proof of the abundant efficacy of "public sympathy" in a good and useful cause.

The experiment of a gathering of the industry of all nations was a novelty, not only as regards England, but the world generally: for, although there have been many expositions of works and manufactures in France, Belgium, and other countries, and also, in particular districts of England, they have been wholly restricted to the products of the country in which they were held; and when, in 1849, the French Minister of Commerce endeavoured to promote an exposition in France upon a wider basis, comprehending the productions of other nations, the prejudices of commercial bodies to whom he communicated it [illegible] dissuaded him from carrying out the scheme.

Nor can it be denied, that when the proposal was made in England, and, indeed, long after that proposal was adopted as a fact, the manufacturing and monied interests of the country looked but coldly upon it, and gave it for a long time an unwilling countenance. Our men of Manchester, and Leeds, and Birmingham, may have thought—and thought with some shadow of truth on their side—that, in an intercommunication of industrial experiences, and a comparison of manufacturing processes with all the world combined, they had less to gain than to give; they may even have feared that their best machinery might be copied—their best hands hired from them; they may have thought, besides, that their business was already enough to occupy all their time and attention at home without making a show of it abroad; and as men of business, and Britons to boot, with something at stake in the land, they may just have shared ever so little in the numerous predictions of trouble and danger which were muttered forth, from time to time, as inevitably attending a large incursion of "disaffected foreigners" from all parts of Europe. As for the agricultural body, they held aloof, because of their political religion they have little sympathy for the restless spirit of industry, which, in their view, has disturbed the harmony and order of our domestic polity, whilst improved methods of tillage, even supposing them to be possible, could only be made the pretence for reducing rents already much too low, and throwing upon the parish agricultural labourers, already much too numerous for the requirements of their respective districts. So little faith had the men of business and the men of land, as yet, in the realisation of "the unity of mankind," in the enlightened and generous spirit propounded by the Prince Consort.

On the other hand, there were enthusiasts—travelled men, doubtless,—who took a very different view of the question, and advocated that view very authoritatively in the columns of an influential daily print. They disabused the artificers of England of their supposed superiority; they took the shine out of them "a few," as the Americans would say; they told them very plainly that they had much, had everything, to learn from foreign taste; that, although they could make things very strong, they could not make them neat, much less elegant, according to the neatness and elegance of the Continental standard;—that their calicoes were stout, but tawdry; that their chairs would last for ages, but that they were fashioned upon barbarous models of ages long gone by; that their doors and locks were effectual for the purpose of exclusion, but repulsive in aspect;—that, in fact, in all that related to appearance we were centuries behind civilised Europe.

There were those again who took leave to doubt and hesitate as to the authenticity of these uncomfortable assertions. Old John Bull threw himself back in his easy chair, with his feet on his double piled Axminster carpet, twiddled his thumbs through his snowy-white lawn shirt frill, gazed vacantly upon the comfortable crimson flock paper-hangings of his *sanctum*

sanctorum, and wondered what people could want more. Young John Bull, who had been his six weeks tour abroad, and had traversed the sandy plains of a Belgian *salon;* had tried his weight upon the uncomfortably shaped rush chair of the French hotel; had admired the mysteries of a German door-handle, all primitive iron, and constructed upon the primitive principle of the first lever;—boldly denied it all and wondered "what they should be told next." And certainly the result of the Great Exhibition has been to disabuse the mind of much of this stupid prejudice, handed down from father to son, and repeated by traveller after traveller, of the infinite superiority in point of taste of the foreign producer. In furniture we certainly have made a very good stand, in respect of appearance alone, to say nothing of solidity; and if in every point we have not equalled the quieter classicism of the French (the classicism of the Louis Quatorze period), we certainly have not been guilty of the excessive and misplaced decoration of the Austrian, nor descended to the crude conceits of the northern German artificers. As to our hardware and our machinery, we need hardly say, that we have shown ourselves, as we were always esteemed to be, without a rival. But we will not be led into making comparisons on other points, as this will be better timed when we have to review the awards of the juries in the several departments.

To return to the point from which we set out. What are the great social advantages which we expect to result from the Great Exhibition of 1851, and in what manner will they conduce to that unity of purpose and interests among men which is so desirable? The advantages which we anticipate are, first, increased knowledge of our own resources, and of the resources of our neighbours, which, whilst it inspires a just confidence in ourselves, will also create a feeling of respect for others; secondly, recognition of the importance of the principles of reciprocal dealing, by which the peculiar advantages of one community may be interchanged for those of another; finally, an enlarged field for commerce and the infusion of a more liberal spirit into commercial transactions, by which commerce will grow, and with it civilisation and peace be extended as the connecting bond of the whole human family.

VEILED SLAVE IN THE MARKET, BY R. MONTI.

SCULPTURE.

The Austrian Sculpture Room contained, amongst other remarkable productions, a marble figure of a "Veiled Vestal," and a "Slave in the Market Place," also veiled, by Raffaelle Monti. In both of these works the illusion was carried so far as to be completely deceptive until the spectator came almost within arm's length of the statue. He then, upon examining the marble, discovered that he had been made the victim of a very ingenious trick, which pretended to represent two surfaces at once, one under the other, in a hard and impenetrable material; a trick, however, in which Truth, as relates to both surfaces, had been disregarded. We shall enter upon this subject at more length when treating of Sculpture as a department; in the meantime, we give an engraving of the Slave in the Market.

Beneath are two very pleasing specimens in the *genre* style, by Benzoni, of Rome. In the one ("Innocence protected by Fidelity)," we observe a little lass asleep, and her canine companion treading upon the head of a viper, which would otherwise have stung her. In the other, entitled "Gratitude," we find the girl carefully abstracting a thorn from the foot of her preserver.

INNOCENCE PROTECTED BY FIDELITY, BY BENZONI.

GRATITUDE, BY BENZONI.

The
CRYSTAL PALACE
AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

No. 5, November 1, 1851 CARVED IVORY THRONE, &c., FROM INDIA, EXHIBITED BY HER MAJESTY. Price One Penny.

FOREIGN AND COLONIAL DEPARTMENTS.

THE EAST INDIAN DEPARTMENT.

THE contributions from the East Indies were considerable in amount and variety, and occupied four or five distinct compartments in the Great Exhibition Building. They were in great measure sent in by the East India Company, but some were exhibited by her Majesty, and not a few came direct from native princes and others of the East. These objects comprise natural products, native manufactures for domestic use, models, and a rich display of articles of jewellery and luxury. We shall devote several articles to the description of this collection so varied and interesting; restricting ourselves, on the present occasion, to some of the most splendid objects which caught the attention of all visitors to the Crystal Palace.

IVORY THRONE.

THE Engraving on the preceding page represents the magnificent throne of carved ivory, which was one of the chief objects of admiration and wonder in the East India Company's room or tent. The carving, both back and front, is most elaborate, and of exquisite finish; the seat and lower part of the back being covered with rich green velvet embroidered in gold. The foot-stool is of like materials and workmanship. This splendid seat is a present to her Majesty, from the Rajah of Travancore, and was used by Prince Albert as President of the Royal Commission, at the closing ceremony, on the 15th October. The chairs on either side of the throne are beautiful specimens of Bombay carving, in black-wood, the boldness and lightness of which are equally remarkable. We shall speak of this branch of industry in a future article.

ROYAL DRESS OF STATE AND JEWELS.

OUR second Engraving page 68, shows that portion of the East Indian collection which was contained in a glass case, enclosed within an iron railing, on the north side of the nave and near the transept. It at first attracted attention by the gorgeous coat of a Sikh chief placed at the top. This coat is of *kinkhob* (cloth of gold), with epaulettes in pearls, and on each two very large valuable emerald drops, and a deep border of rich gold embroidery, beautifully overlaid with pearls, rubies, and emeralds; it was made at Delhi. Each epaulette is valued at 5000*l*. In front of this dress of state are seen the trousers, also of cloth of gold, and the cap of an Indian chief; and on a crimson velvet saddle-cloth a board and set of chessmen in blood-stone and cornelian. In front of these, in embossed or filagree gold with a sort of fan of bird of paradise feathers, are a pair of moorchals, insignia in India of the highest offices, and which not more than half-a-dozen persons are by native custom entitled to bear in the presence of the Governor-General.

There is also a princely girdle of gold, studded with not less than nineteen emeralds, each about an inch and a half square. They are all cut thin and flat, and some of them have inscriptions from the Koran engraved on them, which, though it depreciates their value in this country, renders them almost inestimable in the eyes of the Mohammedan chiefs. The girdle has, besides, a row of diamonds at the top and bottom, and the value of the whole must be enormous.

Whatever the worth of the foregoing may be, they are altogether surpassed by a pair of armlets with three large rubies uncut, but sufficiently polished to show their extreme brilliancy and depth of colour. These rubies were formerly the property of the Emperors of Delhi, and, independently of their enormous value, have a traditional importance attached to their possession. The largest rubies in the collection of Hunt and Roskell, or of the Russian jeweller, are pigmies compared with these unique gems.

In the centre front of the case lies, set round with ten large diamonds, the famous Lahore Diamond, known as the "Durria-i-Noor," or sea of light —ill cut, ill set, but of great size, purity, and value. Near it is a necklace, containing 240 very large and fine Oriental pearls, and which, with a similar string on the right hand side of the case, are valued at not less than 7000*l*.

One of the curiosities of Indian manufacture here displayed is a cannon of white cornelian; the gun-wheels, carriage, and mountings, beautifully worked and put together. The barrel is of a solid piece, bored, and the limber is of blood stone.

More beautiful and elaborate still are some vases, cups, and bowls of rock crystal, beautifully transparent, and mounted in gold; they might be taken by many for mere glass vessels of indifferent quality, and yet their value is from 100*l*. to 200*l*. each; there is one little jewel box in shape of a swan, cut in this crystal, which is as brilliant as a diamond; and there are caskets in a variety of shapes in jade stone, a semi-opaque milky crystal, something resembling opal. The forms of these are very elegant, the arrangement of colour is beautiful, and they are set and inlaid with flowers, emeralds, rubies, topazes, and other precious stones. One of these little boxes, heart shaped, might well serve our jewellers and workers in enamel, and the newly discovered glass mosaic, for a study, so beautifully are the colours and the setting contrasted and harmonised.

HEART-SHAPED DISH OF JASPER, JEWELLED.—EAST INDIA COMPANY.

Close to it lies another lesson for jewellers, in a necklace of exquisitely wrought gold, set with several rows of rubies, and in which the very pattern of the gold, somewhat like the edges of point lace, seems to harmonise with the stones.

The gold and silver filagree chains in this compartment are also wonderful specimens as to minute and delicate workmanship. Among them are two massive necklaces, which might be termed lacework of solid gold, and although these are made of gold wire, they have all the appearance of being chased or chiselled from the solid mass. Some of these specimens are from Agra, Delhi, and Trichinopoly, the latter of which places sends one of its peculiar manufactures, a silver chain, so closely knit and wrought together, that it resembles a solid rod of silver, and yet the joints are so minute and perfect that it bends with all the flexibility of the softest cord of silk.

INDIAN PRESENTS TO HER MAJESTY.

IN a compartment on the south side of the nave were arranged a gorgeous and varied collection of articles of Oriental luxury, which were sent as a present to her Majesty by the Nawab Nizam of Bengal, with a view of their being displayed at the Exhibition, should such be her Majesty's pleasure. The various commodities, which were his own property, were forwarded entirely at the suggestion of his Highness—made only some ten or twelve days before they actually left India—with the concurrence of the Governor-General.

The principal article is a splendid reception seat, a kind of throne; the "shamiana," or canopy, is supported by four silver poles, resting upon a platform raised one foot from the ground, and about twelve feet square. The body, or groundwork of the canopy, consists of purple velvet, with a deep border upon each of its four sides. The corners, as well as the centre piece, are formed of the most exquisite gold and siver embroidery. The centre of the seat consists of rich scarlet velvet, of about eight feet square, surrounded by a splendid border of embroidered gold and silver, of about 18 or 20 inches in width. At the head of the seat is a large scarlet velvet pillow, for the body chiefly to rest upon, with a pair of small pillows, required for the support of other portions of the body, when reclining in the eastern fashion. Behind the larger pillow is a massive frame-work of silver, to prevent its slipping away, and which also serves to support a pair of the most elegant and costly "moorchals," or emblems of dignity, used only by a few of the Indian potentates when in the presence of the Governor-General. The princes of India privileged to use them are the Emperor of Delhi, the King of Lucknow, the Nabob of the Carnatic, Scindia, and one or two others. These emblems consist of hollow cases, of about $2\frac{1}{2}$ feet in length, and about six inches in diameter at the upper end, tapering down to a handle of two inches in diameter. The whole is formed of pieces of pure gold most curiously fastened together by gold thread, and are intended for the reception of the feathers of the beautiful birds of paradise. Of the beauty of the *tout ensemble* which this specimen of Eastern magnificence presents, it would be difficult to convey any adequate idea.

The second article consists of a state palanquin, the body of which is formed of ivory; the canopy, of rich gold embroidery and deep fringe, being supported upon four ivory poles. This palanquin was exclusively employed for the purpose of conveying his Highness the Nawab to the houses of his particular and most intimate relations upon grand levee days. It is provided with poles, covered with crimson velvet, for the bearers to convey it. In the front of the palanquin is a "purdah," a kind of canopy, supported by two projecting and sloping ivory pillars, and which is only allowed to be used by persons of the rank of his Highness. This description of projecting canopy applies not merely to state purposes, but extends to every inferior conveyance the property of his Highness, even down to the smallest cart or vehicle belonging to him.

The third article consists of a "palkee," or palanquin, used only when the sun is below the horizon. It is formed of ivory, and resembles the state palanquin in every respect, with the exception of the canopy. This "palkee" was first used by the ancestor of his Highness on the occasion of a visit of Lord Clive.

The "howdah" resembles to a great extent the state palanquin; it has a sort of double dome canopy, which, like the others, is formed of rich gold and silver embroidery, and, instead of being carried by bearers, it is intended to be borne by an elephant. The "jhool" is a magnificent covering of scarlet velvet richly embroidered, intended to be placed on the back of the elephant, and upon which the "howdah" rests. The other trappings of the elephant consist of a gorgeous head piece and two side-pieces. There are also a variety of horse and camel state trappings, which we need not particularise in detail.

It is not easy to form anything like an estimate of the value of these presents. We believe that the amount of duty paid in respect of them in their transit through the Desert was levied upon them as of the value of 10,000*l.* —but this sum is said to be considerably under their value. Too much praise cannot be accorded to Dr. Young, for the energy and care which he has displayed in the performance of the critical duty with which he was entrusted by his Highness the Nawab, (to whom he is physician) of superintending their conveyance, and for the activity which he must have shown in making all the necessary arrangements for leaving India with his valuable consignment at so short period as ten days' notice.

SOME ACCOUNT OF THE NAWAB NIZAM OF BENGAL.

In connexion with these magnificent presents, we give some account of the Nawab Nizam of Bengal, and his ancestors, and the territory from which they derive their royal title, and over which they ruled until the establishment of the British authority in India.

The present Nawab's ancestors ruled for several centuries as independent sovereigns over the districts of Bengal, Behar, and Orissa, and their residence—at least for a considerable time previous to the British conquest of India—was the city of Moorshedabad, which is situated on the banks of the Hooghly, about 150 miles north of Calcutta. It occupies a perfectly level site, and is destitute of fortifications. Its streets are narrow, irregular, and dirty, and the houses, for the most part, are only one story high, and of mean appearance. Of these the majority are built of earth mixed with chopped straw, and thatched with dried grass, and are called *kutcha;* others are constructed of mud and bricks—a kind of masonry which is styled *pukka kutcha*—while some, called *pukka*, are built entirely of brick. The city contains many curious old mosques, but the only public edifices of any magnitude and architectural beauty, are the Emaumbara, or House of God—to the construction of which the British Government contributed 15,000*l.*,—and the new palace built for the late Nawab. The latter is a spacious edifice in the Doric style, and was erected from the plans and under the superintendence of General Duncan Macleod, at the cost of 66,000*l.* There is a large model of it in Hampton Court Palace, which occupies a pretty large room. The population may be estimated at about 150,000, the bulk of whom are employed in the cultivation of rice and indigo, and the various processes of silk manufacture. Of the numerous factories and filatures, those of Messrs. Lyall and Messrs. Watson are the most extensive, many thousands being daily employed by those houses in spinning and hand-loom weaving. Moorshedabad is also an important mart for cotton, and many of its native merchants have acquired great wealth.

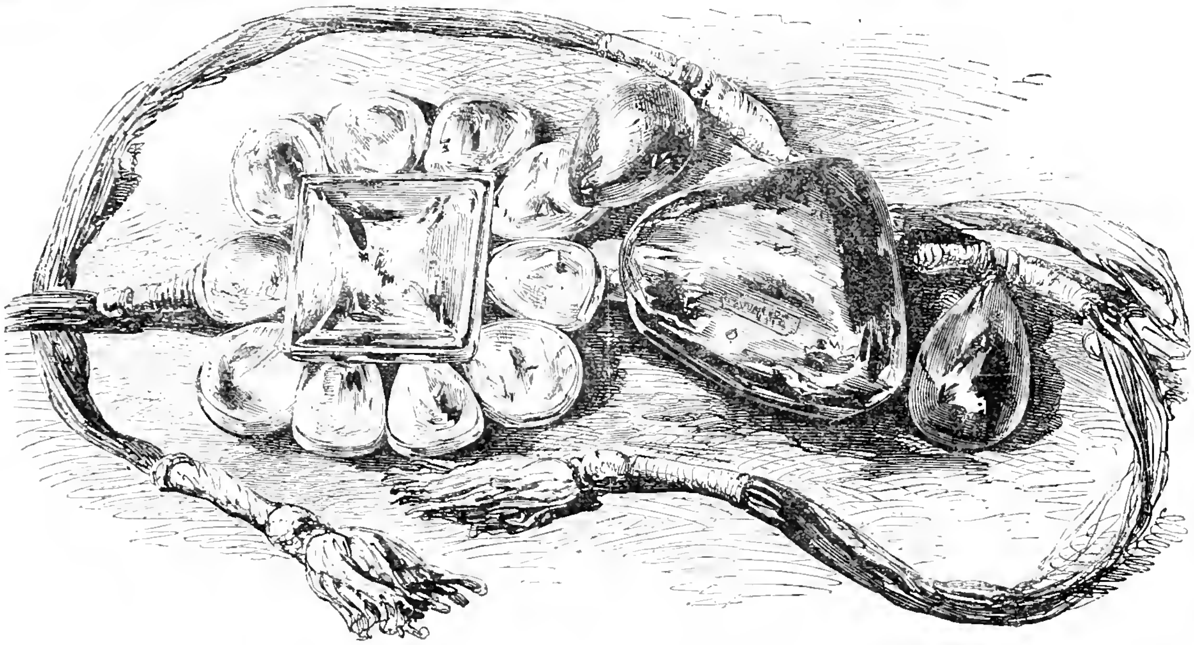
The late Nawab, who died in 1837 or 1838, was the last person on whom the Guelphic order of knighthood was conferred. His successor, the present Nawab, attained his majority four or five years ago, and is now about twenty-three. He has a son by each of his three wives, with whom he lives in his harem, about a quarter of a mile from the new palace, which is only used on *durbar*, or levee days. Of these there are six or eight yearly. On such occasions he is generally borne by eight men in a palkee, or howdah, with poles, like that presented to her Majesty, and is escorted by the principal officers of his household on foot, while he is followed by a numerous train, mounted on elephants, camels, and horses, all gorgeously caparisoned. Those who have seen the rich elephant-trappings at the Exhibition, will be enabled to form some idea of the magnificent spectacle presented by fifty elephants in full state equipment, followed by about a score of camels, and a similar number of horses, with housings of corresponding splendour. The sumptuous canopied couch in which his Highness reclines on reception days, was accurately represented by that at the Exhibition, of which we have already given a detailed description. The natives who attend the *durbar* leave their shoes at the entrance of the reception-hall, and, with head covered, according to the Eastern custom, advance with a series of salaams to his Highness, who is surrounded by his attendants and guards, and on whose left, the place of honour in the East, sits the agent for the Governor-General. They then present him with a mohur—a gold coin 1*l.* 12*s.* in value—and if the person offering it enjoys his favour, he accepts the coin, and pours a few drops of attar of roses on his handkerchief. After this ceremony it is the custom to retire backwards with a repetition of the salaams. Besides the respect and affection with which the present Nizam is regarded on account of his personal qualities, he is also held in great consideration as the head of the sect of Sheahs, who are much looked up to in Lower Bengal.

THE CRYSTAL PALACE BY MOONLIGHT.

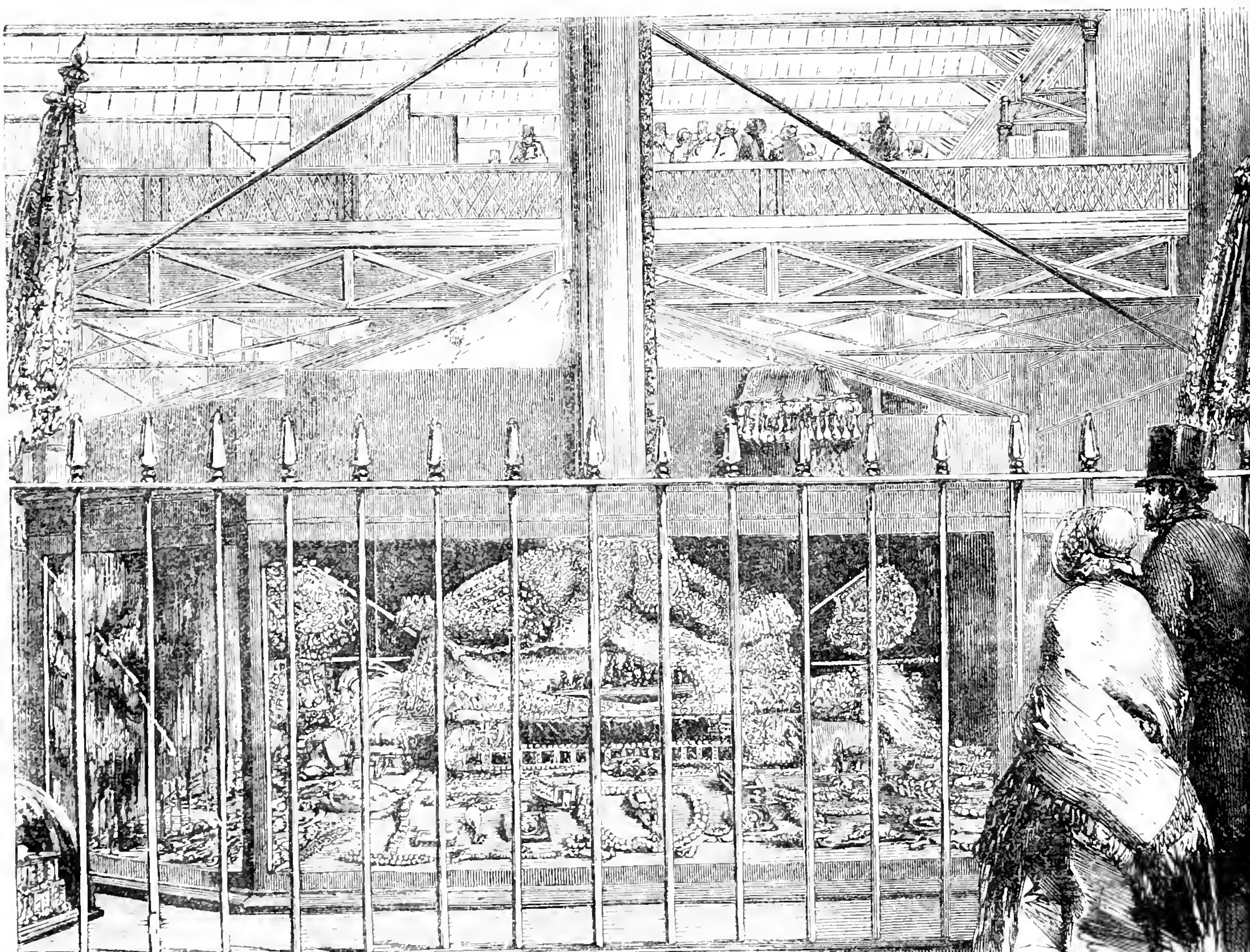
(FROM THE TIMES.)

To those who have seen the interior during the daytime [illegible] thousands of spectators, and agitated by all the bustle [illegible] it is difficult to realise the aspect which the same scene pre[illegible] the crowds have departed, when the gates are closed, and the po[illegible] under their entire control that vast coll[illegible] of the trop[illegible] of human industry. One can scarcely comprehend the strength of that [illegible] in the law and in the security of property which reconciles 15,000 [illegible], gathered from every civilised country in the world, speak[illegible] languages, and brought up under different forms of government, to tr[illegible] the most valued evidences of their skill, their wealth, their [illegible], night after night, to a body of about fifty policemen, paid little a[illegible] the ordinary wages of labour, and armed against dangers from wit[illegible] no weapon more formidable than a bâton. A Russian jeweller [illegible] person we have heard of as showing any uneasiness in the exer[illegible] this confidence. He wanted to be convinced that his diamonds we[illegible] and accordingly he applied for an order to visit them by night. H[illegible] was granted, and he soon had a practical test of the watchful c[illegible] of his property. Standing in front of his glass case and satisfying him[illegible] all was safe, he happened to turn round, and there to his a[illegible] he found that he had a constable at either elbow superintending his movements, and by no means disposed from their looks to take his [illegible] for granted. We visited the Crystal Palace two nights ago, but in a [illegible] tical spirit than the Russian jeweller, and for a different purpose. We wished to see the aspect of the interior under the influence [illegible] clear moonlight, to observe how each object of interest varied in [illegible] when looked at through a new medium, to contrast with the bustle and thronging excitement of the day the effects of silence, solitude and darkness. Let the reader accompany us in our survey and share in the impressions which it produced. In the centre everything was plainly revealed; the pinnacles of the crystal fountain appeared tipped with silver, and in the basin below the ribs and sash-bars overhead and the sky beyond them, and portions of the adjacent galleries, and the occasional glimmer of gas-lights, were all reflected with marvellous distinctness. An air of solemn repose pervaded the vast area; the very statues seemed to rest from the excitement of the day, and to slumber peaceably on their pedestals. Some were enveloped in white coverings, which in the doubtful light gave them a ghostly appearance; others remained unprotected from the night air, and braved exposure to cold as they have already done to criticism.

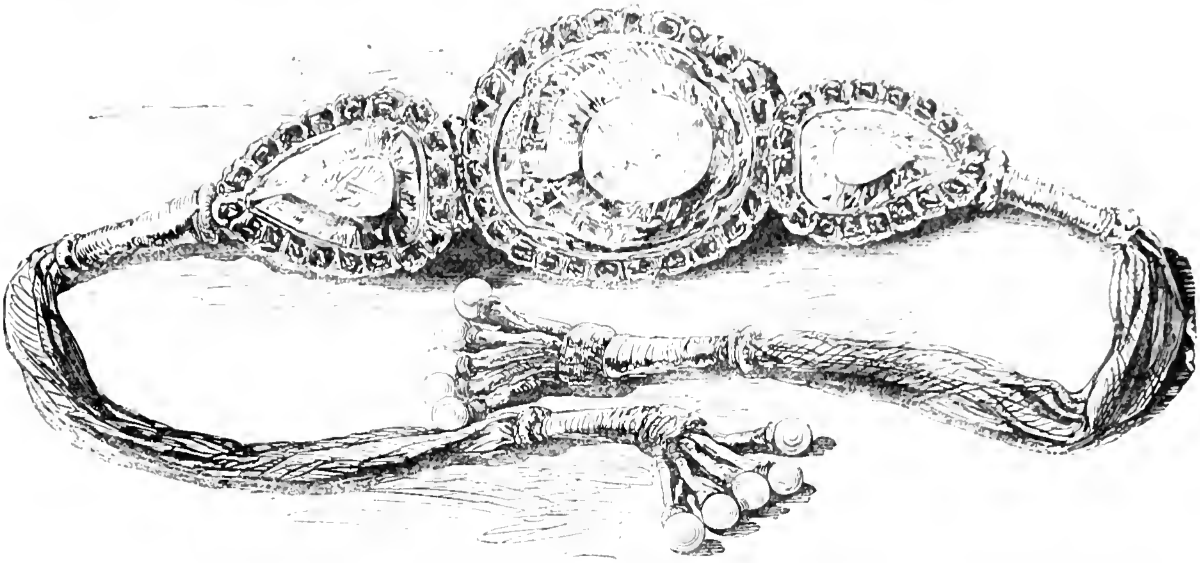
At one point of intersection between the nave and transept Virginius, under the flare of a gas-lamp from the China compartment, brandished the knife with which he had sacrificed his daughter. At another corner, and under a similar dispensation of light from Persia, a cavalier leaned upon his sword, and appeared to be calculating the number of people that had passed him during the day. Of Turkey and Egypt we could see only at the entrance the faint glitter of Damascus blades and of brocaded muslins and trappings. All beyond was buried in darkness and mystery. The shades of night, too, fell heavily upon Greece, Spain, and Italy, though behind them, through the open girders, gleams of unexplained light were seen rising. The zinc statue of the Queen rested in grateful obscurity, and Lemonnière's jewel-case had cautiously been stripped of its attractions. On the metal pipes of Ducroquet's organ some struggling moonbeams played, though without evoking any sound. The colossal group of Cain and his Family looked well in a gloom which seemed suited to his expression of guilt qualified by the traces of human affection. So it was all down the eastern nave. The shadows of night, which fell heavily on some points, were strangely relieved at intervals by gas, which carried the eye forward over intervening objects to those immediately around it. Instead of looking at those things which lay nearest, attention was directed to distant and out of the way spots, brought into prominence by the light streaming upon them. Policemen in list slippers might occasionally be seen flitting noiselessly to a point whence the strangers might be reconnoitred, or suddenly emerging from behind some dark object where they had remained for a time cautiously stowed away. If a court was entered, or a divergence made to the right or to the left, the quick eyes and the scarcely discernible footfall of some member of "the force" followed. Over the whole interior a profound silence reigned, broken only at intervals as the clocks of the building rang out slowly the advancing hour. Turning towards the western half of the interior, huge envelopes of calico concealed most of the objects facing the nave, but the large trophies in the centre remained uncovered, and looked solemn and grand in the dim neutral light which prevailed. The Indian shirts of mail and the model prahus of the East were favoured by the beams of the moon. The chandeliers of Apsley Pellat and Co. caught the eye in passing, and glistened as if anxious to have their illuminating properties tested. Glimpses were again caught of remote galleries brought into prominence by gas-lamps. In some places light shone, though whence it came appeared a mystery. In others there was almost a Cimmerian darkness. The contributions to the carriage department were swathed in calico, while the gigantic locomotives disdained any covering, and rested in grim repose. The activity of mules, spinning-frames, and looms was hushed, the whirl of driving-wheels was silent, and amidst the whole of that usually noisy department dedicated to machinery in motion the only sound we heard was that of a cricket chirruping away merrily amidst Whitworth's tools.



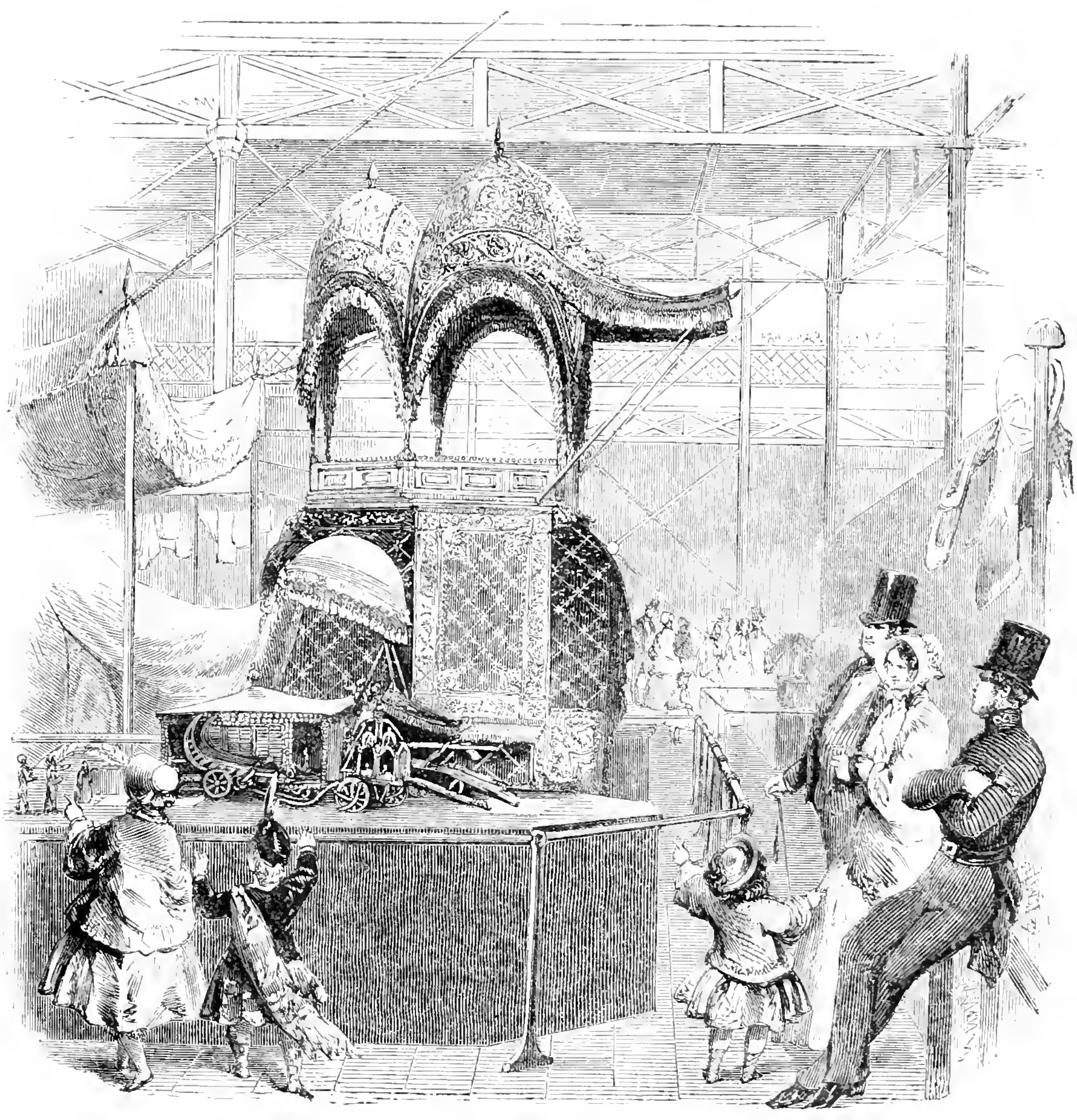
THE DURRIA-I-NOOR, OR SEA OF LIGHT.



COLLECTION OF INDIAN JEWELS, &c. EXHIBITED BY THE EAST INDIA COMPANY.



THE KOH-I-NOOR, OR MOUNTAIN OF LIGHT, IN ITS ORIGINAL SETTING. (For History, see No. I. page 6.



STATE HOWDAH, &c. FROM INDIA, EXHIBITED BY HER MAJESTY.

TEXTILE MANUFACTURES.

COTTON.

THE manufacture of cotton, now the most important of all our branches of industry, is of comparatively recent growth in this country; not dating earlier than the 17th century. For a long period after its first introduction, it was carried on upon a very limited scale; the weavers, for the most part, working at their own homes, purchasing from time to time the materials upon which they worked, and then selling the produce to the dealers in the nearest market. The material employed, also, at this time was only one-half cotton, the warp being of linen. About the middle of the 18th century—scarcely one hundred years ago—the merchants of Manchester began to employ the weavers, furnishing them with the materials, and paying a fixed price for their work.

This movement, which laid the foundation of the "Factory System," was greatly favoured, indeed made inevitable, by the invention of complicated machinery for accomplishing various processes of the manufacture, which could not be used in the small dwellings of the weavers, and required the co-operation of many hands. First in order of these were the carding-machine, for straightening the fibres of the raw cotton, and the spinning-jenny for spinning a number of threads at once, and after some little jealousy and opposition, displacing the old spinning-wheel. These were both the invention of James Hargreaves, a common weaver. Then followed, in 1769, the spinning-frame of Arkwright, by which cotton-yarn could be woven strong enough for warp threads, thus displacing the linen-yarn; and from this time our manufacture of calicoes and twills went on daily thriving. Still, however, there was something wanting to enable our machinery to compete with the foreign hand producer in the finer muslins; until, in 1786, Samuel Crompton brought out his mule jenny, by whose delicate and ingenious mechanism yarn was produced of a fineness and softness never before attained in this country.

This invention Arkwright followed up by many others, either of new or improved processes; whilst others, stimulated by his example and his splendid success, added their quota to the general stock of practical achievement. In 1785, Dr. Cartwright made the first successful attempt to *weave* by machinery: which was subsequently improved, upon a larger scale, by Monteith of Glasgow.

These brief statements comprise the bare facts of the first stage in the great industrial movement which has since brought about such mighty changes, not only in our social and commercial relations, but in our international policy.

Some reminiscences of the individuals connected with this movement are given by a writer in the *Illustrated London News*, Oct. 18, on the occasion of her Majesty's Progress in the manufacturing districts of Manchester. These reminiscences, though they introduce other names and other branches of the subject than those intended to be comprehended within our first article upon "Cotton Manufactures," are so graphically illustrative of the whole subject, that we cannot do better than insert them here.

LOCAL REMINISCENCES OF THE COTTON MANUFACTURES.

LANCASHIRE is less famous for its fields of chivalry than some other counties. When war came in the way of its people they fought, but, except to keep the Scotch at a distance—judging it was better to meet them in Cumberland or Northumberland than in Lancashire—they were not accustomed to go in search of strife by free consent. The infertility, coldness, and excessive moisture of their soil and climate, were not favourable to their country being selected as the camp-ground of contending armies. But its excessive moisture gave birth to streams, which, running from the hills, offered water-power in great abundance; while its treasures of coal, and proximity to the sea, with the habits of frugality and energy which came by nature to a people inhabiting an infertile soil, led to results, on both the Lancashire and Yorkshire side of the hills, which no other space of ground of equal extent has yet been marked with—the triumphs of industry!—is not Lancashire covered with their fame?

To the left of the railway, coming out of Preston, there is a place called Bamber-bridge. There, about 1765, some persons named Clayton first attempted calico printing in Lancashire. Near a place called Knuydon-brook, about two miles east of Blackburn, a tall, robust man, wearing a woollen cloth apron, a calf skin waistcoat, wooden-soled clogs, whose hair was a grizzly reddish colour, who owned forty acres of poor grass land, bearing eight or ten head of stock, and whose three eldest sons worked each at a loom in the dwelling house, was seen by the father of a person still living (the informant of the present writer), standing behind a stone wall, watching the country weavers' return from Blackburn market, to ask them the news on market days, when he had not been there himself. That man, about 1765, went to Bamber bridge to the Claytons, with a piece of cloth made of cotton and linen thread, by one of his sons, which was spoiled in the weaving, and, therefore, unsaleable. He *asked to have it printed in a pattern for kerchiefs, which was done, and the articles worn by the family*. The high price charged for the printing of that piece caused him to attempt the art himself, which he did in a concealed apartment of his house, now used as a dairy room, at Peel Fold, by the present tenant of those forty acres of land. *That man was Robert Peel*, father of the first Sir Robert Peel, the great-calico printer of Bury, in Lancashire, and of Fazely, in Staffordshire. Such was the beginning of calico-printing and the fortunes of the Peels. The females of the family ironed the pieces of cloth in the same secret room, to prevent any prying person—like James Hargreaves, of Stanhill-moor (their nearest neighbour)—from seeing what they did. But that Robert Peel did more. He was the first to supersede the hand-carding of cotton wool, by using cards, one fixed in a block of wood, the other slung from hooks fixed in a beam. These remained in the beams over the kitchen at Peel Fold in 1850, as the present writer witnessed. His carding-machines were broken by a mob of persons from Blackburn, at Peel Fold, and afterwards at Altham. He was at last driven out of the county by the violence of his neighbours, and took refuge at Burton-on-Trent, in Staffordshire.

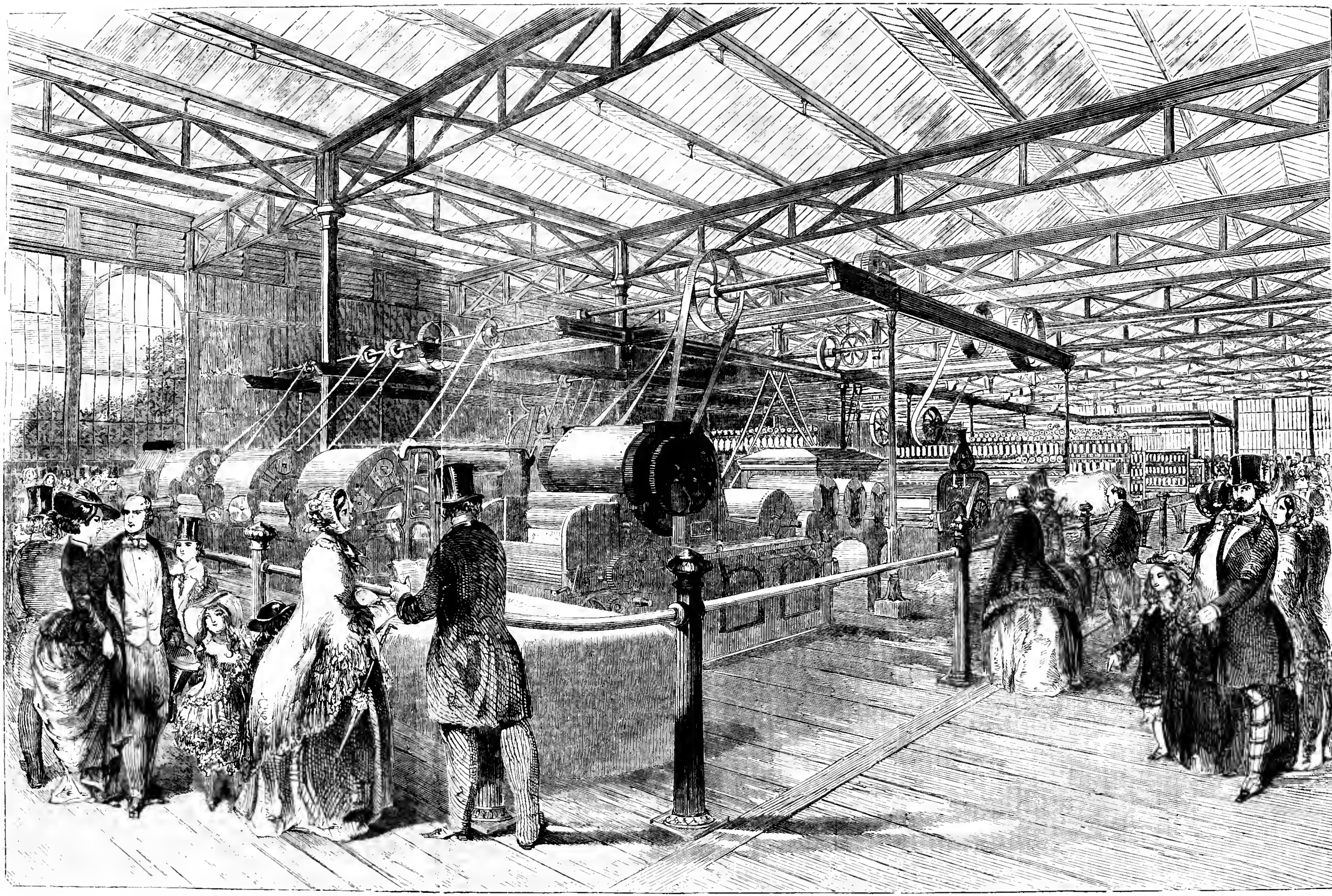
James Hargreaves, of Stanhill-moor, just named, was a weaver. He saw a hand-wheel with a single spindle, then used for spinning cotton wool, overturned. When it fell on its side, the spindle, which was before horizontal, was vertical; and, continuing to revolve, he drew the roving of wool towards him into a thread. The thought seemed at once plausible, that, if something could be applied to hold the rovings as the finger and thumb did, and that something to travel backwards on wheels, six or eight, or even twelve threads, from as many spindles, might be spun at once. This was done. The machine was called the spinning-jenny, and, combined with the roller spinning machine claimed by Arkwright as his invention, has been brought to that perfection seen at the Exhibition in Hyde-Park. Hargreaves, like the first Robert Peel, was expelled from Lancashire partly by the mobs, but also by the magistrates and local gentry, who, fearing that the machines would throw the workpeople on the poor-rates, encouraged the mobs to violence. He went to Nottingham, and, giving the Strutts a property in his jenny, laid the foundation of the opulence of that eminent family of manufacturers.

At Leigh, about half way between Manchester and Liverpool, north of the railway a few miles, lived a man named Thomas Highs. He claimed to be the inventor of spinning by a pair of rollers revolving fast, drawing the rovings through a pair which revolved slowly. Preston was the birthplace of Richard Arkwright; and Bolton (in a house still standing) the place where he carried on the business of hair-dyer and peruke-maker. In travelling the country to collect hair, he found a wife at Leigh, and, visiting that place frequently, he, it has been alleged, wormed the secret of the roller spinning out of Thomas Highs. This might be so; but, if not, the inventor, Arkwright, was still the practical improver of those machines; and the places where he contended with poverty, difficulty, and the combined opposition of every class of men in Lancashire, even of those who used his machines, cannot be looked upon without present interest. Coming by the railway from Preston, a branch is seen leading to Chorley and Bolton. Chorley was the scene of Arkwright's contention with his unkind neighbours, and Birkacre the name of the place where his first mill was attacked, sacked, and burned to the ground. A tall, thin building, too narrow for the machinery now in use, and now used as a store for cotton waste, is seen on the left hand, passing over the inky river Irk, at Manchester, by Ducie Bridge: this was Arkwright's next mill. But his fortune was chiefly made in Derbyshire, about twenty miles from Manchester, where the workpeople hailed him as a benefactor, not as an enemy, and where water-power without limit was found to drive his wheels.

At Bury, where the first Sir Robert Peel established his print-works, and where the late statesman, his son, was born, the fly-shuttle was invented by two brothers named Kay. At Stockport the power-loom was first used. Between Bury and Bolton, a farmer named Samuel Crompton, resident at Hall-i'-the-Wood, was mowing hay with others one day, and suddenly throwing down his scythe, went home and left them. He shut himself in an upper apartment, and was not seen out of the house for some days. The neighbours took a ladder, and ascending to the window, saw him making a machine for spinning. This, when completed, was the "mule," which combined the roller principle of Arkwright and the "jenny" of Hargreaves.

At a place called Mosney, near Preston, one Alexander Bell, employed by the firm of Livesy, Hargreaves, Hall, and Co., was the first, about 1783, to introduce calico-printing by rollers. The effect of this invention and its improvements has been incalculable.

Coming through Kendal from the north, the Royal visitors to Lancashire passed the place where a humble schoolmaster, named John Dalton, lived about the year 1780. In the grand procession through Manchester, they passed the end of a new street cut through a thicket of old lanes, which has been named "John Dalton-street," in honour of that man, and it is but a small homage paid to his memory in comparison with the commercial benefits derived from his scientific researches. He discovered and taught the theory, now amply verified, that all matter exists in atoms, which in weight bear an exact mathematical proportion to each other; that in chemical combinations these proportions are absolutely observed; and that, consequently, the dyer and calico-printer can only make "fast colours" by using the mathematical proportions ruled by this law of atoms. This much in brief; but it is an imperfect outline of that discovery of Dalton, so momentous to all chemists, and particularly to the bleachers, dyers, and printers. The economy in labour, material, and time, the extension of their trade, and the higher excellence in their productions, are such, that the value of this truth in chemistry, expressed in millions sterling, if known, would startle us alike in writing and reading its sum.



COTTON MACHINERY OF MESSRS. HIBBETT, PLATT, AND SONS.

LITERATURE OF THE GREAT EXHIBITION.

THE EXHIBITION AND ITS MANAGEMENT.

(FROM THE ILLUSTRATED LONDON NEWS, OCT. 18.)

If the novelty of the undertaking occasioned the promoters of it to be altogether unprepared for the vast success, in a pecuniary point of view, which has attended it, so it may excuse them for many errors of omission and commission, by which the opportunities which such an undertaking might have afforded, have not been turned to the very best account; and if we now proceed to review the management of the Executive of the Great Exhibition, it is simply by way of providing a lesson of experience for the regulation of future undertakings of the kind which may occur in this country or elsewhere. Many of the sins of the Executive may be traced to the simple fact of their want of means in the outset, and their doubt as to amount of means which the sympathy of the public might place at their disposal. The project had to work its way into the favour and into the pockets of the public, and that against a strong tide of prejudice and opposition. And in this they had still a double task: they had to promise an alluring Exhibition to the sight-seeing public, and they had, at the same time, to canvass the manufacturers and producers for contributions in aid of the general display; and we know that in very many instances it was not til the very last moment that the local committees succeeded in inducing proprietors of goods to send them in, and then it was very often done as a personal favour to the energetic agent. In the midst of all this doubt and struggle it was that Mr. Paxton's letter came out, which to all the world seemed very like a tender of resignation of business on behalf of the whole body; and by many of the Mrs. Candour and Backbiter families was exaggerated into an actual declaration of bankruptcy. Added to this was the rumour that the Building itself was not water-tight, and could not possibly outlive the heavy rains at that time prevailing.

In this critical position of affairs, the Press, whose agents had been admitted to the inside of the Building, and who reported its actual condition, and its gradual furnishing forth with goods of all sorts, from all parts of the world—the Press, we say, came to the rescue of the apparently devoted enterprise; and many British producers, who had hitherto held aloof, found themselves forced or shamed into sending in contributions to compete with those so abundantly transmitted by foreign rivals. One little month of tolerably fine weather, one little month of newspaper spoon-feeding, changed the whole aspect of affairs. Season tickets were eagerly bought; and when it was announced that her Majesty would give her solemn sanction to the great principle involved at bottom in the project, and honour the World's Industrial Congress by inaugurating its proceedings in person, the public, as publics will, became worked up to the wildest pitch of excitement—and filled with anxiety to obtain ingress within the walls of the Crystal Palace, which now promised to be fashionable. And here the Commissioners committed, or meditated the commission of, two grave errors, one upon the other; though they were fortunately prevented from carrying either into execution by the loud and unanimous voice of public opinion and the good sense and good feeling of the Queen and the Prince Consort. The one was the proposal that her Majesty should inaugurate the greatest public institution of modern history in private, attended only by the Commissioners and a retinue of beef eaters and policemen in private! Let those who recollect the vast and animated assemblage, which cheered and roared with ecstacy when the Queen of "Merry England" walked along the main avenues of the Crystal Palace on that glorious 1st of May, and then the shout of exultation when she declared the Exhibition open, contemplate the amount of *lèse majesté* and the depth of ignominy which would have been involved in denying her Majesty and her loyal subjects and foreign guests the heartfelt pride and satisfaction of that day's ceremonial! The other error of the Executive at this time, when it was determined that the public should be admitted, was the attempt to make a show of Royalty, by raising the price of season tickets—an attempt which, as soon as it came to the knowledge of the Prince President of the Commission, he very promptly reprobated and prohibited.

The exclusion of exhibitors was an error—a serious error, as regarded the enjoyment of the public, the results of the Exhibition, and the interests of the exhibitors. And this injustice, this stupid blunder, was perpetrated and persisted in, in the same paltry spirit which devised the idea of setting a premium upon the gracious smiles of our Queen; which farmed out the responsibility and privileges connected with the publication of the Catalogue as a property, instead of working upon it as a labour of love tending to the honour and usefulness of the whole undertaking; the same spirit of penury which farmed the monopoly of retailing tea, coffee, ices, and "other light refreshments," at heavy rates of charge, and to caterers who insisted upon demanding 1*d*. for a glass of "iced water" to wash down a thimblefull of ice, in face of the announcement that "water is given away" (water unneed being never to be had); the same spirit of penury in which, up to the last day, a deaf ear was turned to all suggestions for an abandonment of, or even a reduction upon the absolute shilling, on behalf of numerous industrious classes, as policemen, omnibus drivers, public schools, &c., who had but few opportunities of participating in the intellectual enjoyments of their fellow-citizens; the same spirit of penury and pence gathering which originated many a little job, to the disparagement of the public interests, the lessening of their enjoyment of their own Exhibition—for was not the Exhibition the public's own, when it was made up of voluntary contributions from the manufacturing community, stored in a house built upon public property, and rescued from all risk of failure by the shillings of the multitude? All that the Commissioners can lay claim to is the glass-house, and that they only had through a happy accident; and that they wanted to get off their hands before the time arrived for opening its doors. The bare walls were thrown open to the public, and the public provided the entertainment, and found the company and the money. How little the Commissioners have done to reciprocate the liberal spirit of the public—to promote the interests of exhibitors, which was a secondary inducement—and the interests of science and knowledge, which was the paramount inducement to the undertaking—are questions which are very fairly debatable by public journalists.

In assembling together the richest assortment of natural products and manufactured wares, of machinery and philosophical instruments, from all quarters of the globe, which the world ever saw collected together, the first step was taken to the acquirement of a full knowledge of the state of human science and industry over the whole face of the globe; and the materials so obtained, if properly made use of, would have formed a complete store of practical knowledge, a perfect encyclopaedia of human intelligence, which would have been invaluable as an authority—a starting-point for the future. But how if half these productions were promiscuously thrown together, badly classified, and therefore unattainable without guides or direction-posts? how if many of them were so inclosed under glass cases that it became impossible to examine their properties! and how if the peculiarities of nine-tenths of them were unintelligible to the general observer, without explanation from the owner or producer? and how if the owner or producer was excluded from the privilege of presiding over the portion of the intellectual banquet which he had provided? Why, in all such cases, the Exhibition became an unprofitable and provoking blank and a delusion—unless, indeed the Executive, who had driven away the legitimate and natural guardians of the various objects had taken the task of expounding their properties upon themselves. But they did no such thing. They sold their birthright in the Catalogue for a mess of pottage (3200*l*., and "a Royalty" of twopence upon every copy sold in the Building), as a commercial speculation. And when, in the excitement of catering for advertisements, the contractors forgot to take the necessary steps and engage the necessary assistance to collect and arrange the contents of the Catalogue; when the Catalogue was discovered to be a heavy humbug, from which no information could be obtained; and when the "second edition," and the "second corrected edition," and each succeeding "corrected edition," was found to be as unintelligible as the original Simon Pure; when, in despair, the public—having spent successive shillings in successive visits and successive purchases of catalogues and guides and hand-books—still rushed wildly and hopelessly about, inquiring for Class A 995, or the Naval Architecture department, or the Raw Produce department, what did the Commissioners do? They issued a hand-bill, in which they announced that they had found out another job, involving another shilling's worth at their disposal, and had already farmed it to an enterprising commercial company. This document, which deserves to be kept as a matter of history, ran as follows:—

"CRYSTAL PALACE.—Approved and qualified persons to act as guides, showing visitors through the Building by the hour. Particulars:—Parties not exceeding three—First hour, 2*s*.; every other hour, 1*s*: Parties not exceeding six—first hour, 6*d*. each person; every other hour, 4*d*. each person. N.B.—The person acting as guide will show all the principal objects in the Building. Apply to the Superintendent at the south entrance. —— —— Office, —— street, City."

After this, to ask your way, to ask the simplest question of a policeman or any functionary in the Building, was constructively an infringement of the rights and privileges of the Guide Company, and such applications were very properly met with the reply—"There are guides appointed, and if you want information you must pay for it."

The foreign exhibitors, particularly the French, with their older experience in expositions and bazaars, perceived the importance of having some one on the spot to display and explain the merits of their wares, and have generally done so at the cost of a season ticket; and, as a consequence, a very striking contrast has been presented between the aspect and atmosphere of the foreign and the British departments. In the former you were greeted with the blandest of smiles, welcome to examine, invited to touch—we will not say urged to purchase, the various beautiful objects, which, without such means of scrutinising, might have lain as dead lumber in an outhouse, for all the spectator cared: in the latter, with few exceptions, all has been still life—a huge town of shops without a shopman amongst them; and if you did but look a little closely, and pull out your pocket-book to make a note, one of the thousand extra policemen appointed for Exhibition purposes interrupted you with an authoritative "You must not copy anything;" and if you did but lay a finger upon pot or plough-handle—good gracious! Scotland-yard forbid! We do not exaggerate one iota in this statement, for annoying incidents of this kind have occurred frequently to us in the course of our critical vocations. And with respect to the locking up of goods, we will only instance one branch of manufacture, that of Locks

Though these be some of the more prominent incidents which mark the memorable spots in Lancashire, they are but few, a very few of the whole, which have reared up that matchless productive power of machinery, which, at the date of six centuries after the Norman Conquest, found Lancashire, though not a wilderness, still a comparative waste, thinly peopled, which has since covered the surface with human life and wealth; which, gathering together the rude products of that clime, diffuses them as comforts and elegancies to every race—the material for a printed calico worn by the ploughman's wife at 4d. a yard being cotton from America, indigo from Asia, madder from Europe, and gum from Africa: a power of production which attracts, by the abundance of the merchandise it creates, the luxuries of all the world in exchange, which in Lancashire and elsewhere in the kingdom gives an ability to bear taxation that in turn confers on Britain a military and naval strength that withstood the most successful commander that ever led armies to battle, his armies sustained by the plunder of all Europe; a power of production and financial strength which endorsed the bills of nearly every European nation opposed to France, and gave them subsidies in addition, from British taxes, to induce them to rise against their invader, when prostrate at his feet; a power which, more recently, when the nations were shaken by revolution, gave firmness to Britain, as it this day enables our Queen to move among a free people with a sense of safety and joyousness of welcome unknown to any other Sovereign. Such are the triumphs of industry, the conquests of science, whose fields of success are found through all Britain, but in greater number in Lancashire than elsewhere—such the high services to civilisation which industry and science have rendered.

The quantity of cotton imported into this country in 1764 was about 4,000,000 lb.; in 1780, about 7,000,000 lb.; in 1790, about 30,000,000 lb.; and in 1800, about 50,000,000 lb. There was little increase during the period of the war; but since the restoration of peace, the consumption of raw cotton, and with it the employment of our factory labour, has increased with a rapidity almost beyond the power of conception.

In 1815 the imports were	. . . . .	99,000,000 lb.
„ 1825	„	229,000,000 „
„ 1835	„	364,000,000 „
„ 1845	„	722,000,000 „

The value of cotton manufactures produced in Great Britain in 1841, was estimated by Mr. Porter at 49,000,000*l*.; and of these about one-half were exported.

The number of hands employed in the cotton factories of Great Britain may be roundly set down at half-a-million but upon this and other statistical details we shall enter more at large in a separate paper.

COTTON-SPINNING MACHINERY DESCRIBED.

We now proceed to give a description of some of the works in cotton manufacture, as illustrated in the Great Exhibition; and towards this end we we think we cannot do better than ask the reader to accompany us in an imaginary reminiscence of the extreme west end of the Crystal Palace, where a very complete series of this class of machinery was exhibited by Messrs. Hibbert, Platt, and Sons, of Oldham, showing the processes of manufacture, from the cotton as it is taken out of the bale on its arrival in this country, to the time of its completion in the form of woven calico, twills, &c. (See large Engraving, pages 72 and 73.)

First in the series is an opening-machine, on Calvert's principle. It is fed by an endless cloth; on which the cotton is spread, and is drawn into the machine by a continuous movement of the cloth towards two rollers, armed with coarse but not very sharp teeth. These seize the cotton, and draw the entangled locks apart, and then pass them on to other and finer-toothed rollers, which still further open and straighten the fibres; and the clean cotton is thrown out at the other end of the machine, while the seed and dirt fall out below.

The cotton is then taken to a second opening and scutching-machine; here it is again put on a moving, endless apron, and introduced into the machine by being drawn between a pair of rollers, and delivered slowly out to meet the blows of the "beater," which revolves with great rapidity, and drives all the heavy particles of dirt, sand, &c., down through a grating—which, however, is too fine to allow the flakes of cotton to pass through. These are carried through to an iron roller, round which they are led, and as the roller is kept revolving, they are wound on it so as to form a continuous sheet of loose, fleecy texture, called a "lap." This lap is then transferred to the first, or breaker carding-machine, and the end of the lap last wound on the roller is led in between two feeding-rollers, and carried by them into contact with the cards of the machine which draw out and straighten the fibres of the cotton.

The large cylinder on which the cards are fixed is made of iron, and is turned perfectly true. The cards are fastened to it by nails driven into small wooden plugs inserted at intervals in the circumference of the iron cylinders, and the patent bracket-slides for carrying the smaller rollers are remarkable for the simplicity and solidity of their construction. After passing over the surfaces of the card-rollers, the cotton is stripped off the last roller, called a "doffer," by means of a steel comb, or doffing plate, mounted on an iron stock instead of wood, the whole width of the doffer, which rises and falls with a sort of chopping motion, and at each fall catches a number of the fibres, and, disengaging them from the wires of the cards, forms them into a loose, open, broad film of cotton, called a "sliver." The end of this is narrowed, and led into a conical aperture, about an inch in diameter, in the top of the coiler. Inside the coiler is placed a pair of rollers, which take the end of the sliver first presented, and continue to draw it through the conical hole, and deliver it into a deep can, placed below the rollers, until it is full, when the end is broken off.

The can is then taken to the next machine, called a "lap machine," and is there placed alongside numerous similar cans; and the ends last broken are led one out of each can, and introduced between a pair of rollers, which draw all the several slivers at one time into the machine, and coil them side by side on a small iron roller, so as to make them into a lap—that is, a long sheet formed of the slivers, which adhere to one another in some degree.

This lap is now transferred to the second or finishing-carder, and is still further carded, doffed, and coiled in the cans, as previously described. The lap, which, when it enters the machine, is formed of 30 or 40 single slivers, is carded down in substance so much that, when taken off at the doffing-roller, it only forms one sliver out of the whole number that entered, and thus the effect of any irregularity that may exist in any one sliver is entirely lost in that which is composed of so many various ones. The cans from the finishing carding-engine are now taken to the drawing-frame, and the slivers are first passed through a pair of rollers travelling at a low speed, and are then seized by the next pair which run faster, and therefore draw away the cotton at a greater rate than it is furnished to them by the first pair. This has the effect of making the sliver longer and thinner, and at the same time straightens the fibres: and it is still more drawn by a third, and even a fourth or fifth pair of rollers travelling faster than the middle pair, so that the slivers are very much attenuated by this process. Three of these slivers are led into one conical hole in the coiler, and the cans, revolving as before described, coil the sliver inside them.

The cans containing these last slivers from the drawing-frame are taken to the slubbing-frame, where the slivers are to receive a slight degree of twist. Previously to this, however, they are led out of the cans, and passed through three lines of drawing-rollers, to reduce the size of the sliver and to straighten the fibres still more. After passing these drawing-rollers they pass down to the "flyers," which, in these machines, are of an improved construction, the spindles having two inches' more bearing, and the flyer having a one-inch shorter leg—an advantage that enables the manufacturer to run the spindles one-fifth faster than by the usual construction.

The flyers give a certain amount of twist to the "slubbing," and it is by them wound on bobbins, which are then transferred to the second or intermediate slubbing-frame. Here the cotton undergoes a process similar to, but finer than, that of the first slubbing-frame. The roving-frame comes next, and the bobbins from the second slubbing frame are placed in it; the slubbings are here reduced by the drawing-rollers still finer; they are then twisted still more by the flyers, and, lastly, they are wound on bobbins.

The "mule" is the machine next in order. Here the bobbins, taken from the roving-frame, are again passed through three lines of smaller drawing rollers, and then delivered on to the points of the spindles, which, by their rapid revolution at the time the carriage is drawn out, twist the roving into yarn. On the return of the carriage the twisting operation ceases for a time, and the newly-spun yarn is wound on to the spindles in the well known form of "cops."

One of the mules shown is a weft-mule, with tin rollers. The other is a warp or twist-mule, but with drums instead of the rollers, to show the variety of mechanism.

The twist-mule has also a back shaft the whole length of the machine, instead of squaring-bands, as in the weft-mule, for the same reason. The head-stock is based on the principle of Sharp and Roberts' expired patent. All the bearings are constructed with unusual solidity on the patent principle of Messrs. Hibbert and Platt, and are bushed so as to be easily repaired; as also the adjustable spring "camm" for "backing off," and the adjustable catch-box on the front roller for preventing "snarls."

The throstle for spinning warp yarn is an excellent specimen of workmanship, the holes being all machine-drilled at one operation. The roller beams are all planed true, and the heart-wheel and rack are in the centre instead of at the end. This description of machine is much used for the coarser description of yarn, but for the finer numbers it does not compete successfully with the mule.

The doubling-frame is the next machine, and is used to twist two yarns together into one thread for strong warps, as stocking yarns, and also for sewing-cotton.

The binding-machine follows, and is shown with two sorts of arrangement—that for winding twist-mule cops on one side, and that for throstle bobbins on the other; both these are wound on to large bobbins, ready for the next machine, which is called the beaming or warping machine. It is fitted up in the same superior style as the others, and has Kenworthy's patent rods. Here the warp is transferred from the large bobbins to the warp-beams, or rollers, ready for the dressing-machine, which, however, is not shown in this series, as it is a machine requiring a room to itself, to prevent the steam employed from being a detriment to the other mechanism.

The dressing process consists in dressing or coating the warp threads with a paste made from flour, to stiffen the threads for the loom. (The first invention for this purpose was that of Radcliffe, in 1804.)

The looms are the machines which follow, where the yarns, both weft and warp, are woven into cloth. But we shall here take leave of the subject for the present, with the intention of resuming it, with fitting illustrations on an early occasion.

and Keys, upon which we were anxious to obtain all the information we could for publication in this Journal: yet, although we have made a dozen journeys to the hardware department, and hovered anxiously about the glass cases, filled with some five hundred different kinds of infallible locks, we have not to this day been able to inspect, or obtain any information concerning any one of them.

The regulation prohibiting the affixing of prices to articles exhibited, might have had something to recommend it in the eyes of the Commissioners; but, upon the whole, it appears so clearly to be at variance with the grand object of the Exhibition—that of obtaining and promulgating information upon all points relating to the manufacturing interests and processes, both of ourselves and of other nations—that it ought not to have been persisted in after its impolicy had been pointed out. And surely the price at which any article may be produced is an important element of the value of the process by which it is produced; and to deny the manufacturer the privilege of announcing this particular, was as absurd as it was unjust. The exhibitors, however, soon got over this difficulty by resorting to the distribution of prospectuses, with priced lists of all their wares (we have one by us wherein an Irish Earl recommends his tile bricks), and steam presses in one part of the Building, were kept hard at work, throwing off reams of puffs for exhibitors in other departments; and the Executive Committee have been so amused and gratified with this contravention of their orders, that they have set about collecting, in the Building itself, fifty copies of all the puff-mongery of the Great Exhibition, for the purpose of being bound up and deposited in the Bodleian and other public libraries! In addition to this, the agents for the Foreign departments very early resorted to the expedient of printing "priced catalogues" of their goods; the Zollverein, Russia, Saxony, Austria, have each their handbook, completed with their details of *£ s. d.*; and very interesting they will be as materials for a new edition of the "History of Prices;" but when it came to the turn of the British exhibitor, he was referred to Messrs. Spicer and Clowes, "the contractors," who demanded a shilling a line for the insertion of the descriptions and prices of their goods. In short, the Great Exhibition has been converted into a great job, and all its minutest details have resolved into jobs smaller and beautifully less.

We have not left ourselves space in this article to review the general contents of the Exhibition, and to see how far they filled up the scheme which the mind's eye might have framed for it. We cannot help observing, however, that they have been wanting in many essential particulars, and were too generally not disposed to advantage. The manufacturing appliances of this country, which ought to have been the principal features of the whole affair, have been very inadequately represented; many branches of manufacture wholly absent; and the machinery which was sent in, consigned to a sort of back-shop, where they were crowded together, without order of arrangement, without space between them to inspect them in operation; and many of them, Nasmyth's steam hammer, to wit, not in operation at all, owing to the want of steam. The collections of raw materials, instead of being classed in groups comprising the various contributions from all parts, and those groups in convenient proximity to the machinery which respectively related to their manufacture, have been scattered about in all directions, generally in the backways, in such a manner as to be utterly useless for the purposes of scientific research. Our vast navy and commercial marine; our shipbuilding has been wholly unrepresented, with the exception of a toy model of the *Queen* in the transept, and a few models of lifeboats stowed very carefully out of sight, in the rear of the western gallery—a seclusion in which we only discovered them after many a fruitless voyage of discovery. The exclusion of works of painting from the scheme of the Exhibition we have already, in a previous article, commented upon, as most ill-judged. If it did nothing else, it converted the so-called Fine Art Court into a mere toy-shop—an object of ridicule to all observers of mature age.

In short, money-getting being the object, everything was sacrificed to show and sound; the most gaudy inutilities and commonplaces were thrust into the foreground, and plain usefulness was ordered to the rear, to shift for itself where it could. Trophies of silk and trophies of glass, trophies of tapestry, trophies of timber, trophies of feathers, astonished open-mouthed gapers at every point along the main avenues, who, perhaps, forgot that all these trophies were only made up of very common ingredients, which might be examined in detail in the shops of Bond-street and Oxford-street. Koh-i-noor diamonds, jewelled hawks, court jewels from Spain and Russia, and gold and precious stones, the spoil of Eastern dynasties now extinct, were added by the liberality of their respective owners "to make up a show," and to divert the dazzled multitude from the more utilitarian and instructive purposes of the Exhibition. The foreign departments again took the lead of us in an important element of stage effect; the national colours were suspended over the various departments, and the "effect" so delighted the Executive Committee, being an inexpensive addition to their shilling show, that they gravely penned a circular to all the principal contributing towns in Great Britain, begging them to send up flags emblazoned with their respective arms, wherewith to decorate the British Nave!

Is it to be wondered at, that, conducted after this principle, the Great Exhibition of Industry became, to a great portion of the multitudes who thronged its avenues, an idle lounge—a huge bazaar—a covered Regent-street—a promenade *concert monstre!* Those dread organs—north, south, east, and west, and that dreadest of all in the Foreign Nave, all thundering a perpetual competition; those jingling pianos, in every highway and byway, and nook and corner of the Building; here musical bells, with a mob of idle listeners; and still prevailing through the general din that Herr *Tonnerre*, who, according to daily advertisements, daily, for four long hours, played popular opera airs and polkas upon his *Tonnerrophone*, an instrument which (quoth the *Daily News*, "although of comparatively small size, is of tremendous power and compass—the tones completely filling the vast edifice." None but those who have been subjected to the influence of this colossal Babel can imagine the bewildering effect; none who have, will ever forget it.

Amidst this state of things the Press again came to the rescue; its various agents prying and scrutinising in all quarters, and in spite of many difficulties, proceeding to unravel the web of confusion in which things left to shift for themselves had resolved themselves, to drag from concealment and expound to the reading public objects of real importance, which otherwise have been in a great measure overlooked; and by their labours they have preserved materials which will prove of value in aid of the history of art and of the progress of society. On the occasion of any future Exhibition of the kind, however, those who have the management of it will do well to avoid some of the errors of judgment on which we have felt it our duty to animadvert in the foregoing columns. [The above observations, though severe, we think are just. They are echoed, in all their details, in the *Observer* of the following week, and have obviously given the cue to several other "organs" for their parting notices of the Great Exhibition.]

THE VEGETABLE PRODUCTS OF SCOTLAND.

AMONG the many miles of counters and cases in the World's Fair, there were few more interesting than the collection of the vegetable productions of Scotland, contributed by Messrs. Lawson of Edinburgh. The collection was divided into six classes, arranged in extensive cabinets of mahogany and glass, thus:—class 1, plants cultivated for their seeds and straw; 2, for herbage and forage; 3, for the roots; 4, for use in the arts and manufactures; 5, for their medical properties; and 6, those cultivated for their timber. There were drawings of the several plants, specimens of the dried, the flowers, the seeds, the various roots—either natural or fac-similes in wax—and longitudinal and vertical sections of timber and other trees, showing the same sections both in the rough and in the polished state, joined in most examples by a hinge, and in some few similar sections of appendant branches. Not only have Messrs. Lawson been at the expense of fitting up this portion of the Exhibition, but they have been minded and desirous to make it as understandable as possible to all. They are themselves the authors of a Synopsis, which is divided into six divisions as above, each of which forms a distinct quarto volume, or the whole may be had in one. The Synopsis includes a short and interesting history of Scottish agriculture. In it we are occasionally reminded of some curious facts respecting the effects of culture on some plants. For instance, how the poisonous Solanum tuberosum becomes the wholesome potato; the Brassicæ, or cabbage tribe, attains its remarkable changes; how, "from the common or wild cabbage (Brassica oleracea), a poor weed-like plant of the sea-coast, it is brought up to be, at will, either the gigantic tree or cow-cabbage, the compact drum-head, the Brussels sprouts, red-cabbage, cauliflower, or khol-rabi;" how the poisonous old peach of India becomes the luscious fruit in our gardens; how, "in short, the parts of even ornamental plants extend, those of flowers multiply and reduplicate, and colours change, and vary, and improve under the magic touch of culture." We understand that since the close of the Exhibition, the interesting collection above described has been purchased for 700*l.* (not much more than a tithe of what it cost), to form the nucleus of a Museum of Economic Botany about to be established at Kew.

PRODUCTS OF PEAT.—Sir R. Kane has presented a report on the chemical products of Irish peat. As to the products obtainable, he confirms, in a great measure, the statements put forth by the patentee, Mr. Reece, as will be seen from the subjoined table:—

From 1000 parts of Peat.	Reece.	Kane.
Sulphate ammonia	1.000	1.119
Acetate of lime	.700	.305
Wood naphtha	.185	.140
Paraffine	.104	.125
Fixed oils	.714	1.059
Volatile oils	.375	

With the exception of the acetate of lime, the statements of Mr. Reece are evidently not exaggerated, as to quantity. As regards the cost of production, Sir R. Kane considers that any absolute opinion would be premature.

FOX'S MAGNETISED BALANCE. One of the most interesting objects in the department of Philosophical Instruments, was Fox's magnetised balance, capable, as is stated, of weighing to the $\frac{1}{10000}$th of a grain: what is the extreme weight which it will bear is not mentioned. The most delicate balance previously in existence, that of the Institute of France, turns, we believe, with the $\frac{1}{7000}$th of a grain. Various other chemical balances, as by De Grave and Co., and especially one by Oertling (performing to the $\frac{1}{1000}$th of a grain, when loaded with 1000 grains, or $\frac{1}{1000000}$th of the entire weight), are also worthy of notice. Several balances of foreign make (Luhme of Berlin) seem very carefully executed. It is to be regretted that these and various other articles for scientific purposes of foreign make could not have had their prices affixed for the information of the apparatus-buying public in England.

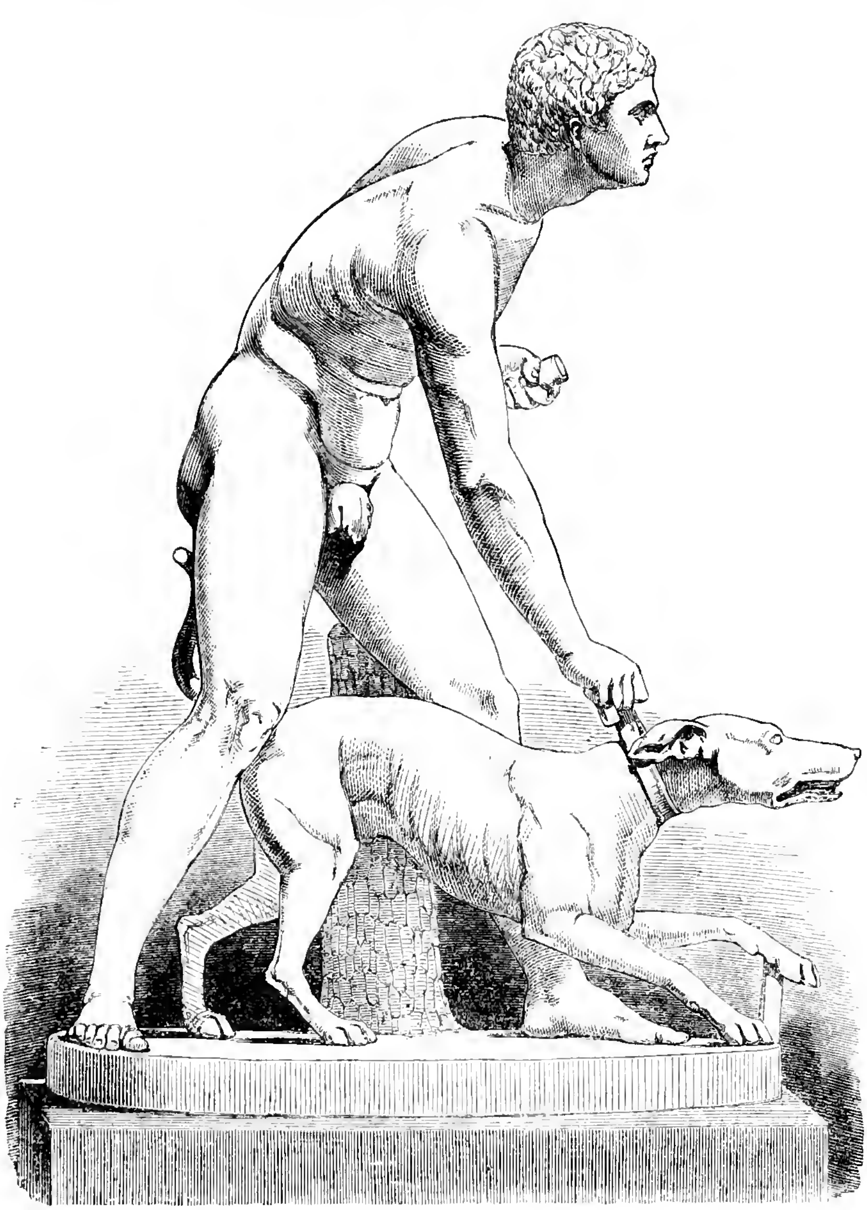
THE ARTS OF DESIGN AND DECORATION.

SCULPTURE.

THE works in sculpture exhibited in the Crystal Palace, although they contributed in no small degree to the beautiful effect of the whole display, were not individually such as to exalt our opinion of the present state of that art, and we would fain hope did not pourtray existing art in its highest development. The contributions, both British and Foreign, were miscellaneous, and to a great extent accidental; and we must believe that, the announcement of the purely utilitarian character of the Exhibition, deterred many labourers in the higher fields of art from sending in works, which, though individually they would have done honour to themselves and the arts of the countries to which they belonged, they fancied, might be overlooked or ill appreciated in the general gathering.

Commencing our observations in this department with the British School, we are bound to say, that a careful survey of the works in sculpture sent in for exhibition here, has by no means elevated our previously entertained notions of the *status* of the plastic art in this country. The cause of this shortcoming is a want of appreciation on the part of artists of the true objects and destinies of art.

Want of patronage is the common cry with artists, as with actors and men of all professions who happen to fail of success commensurate with their own estimate of their merits. Like Danaë, the coy genius of sculpture is only to be won by a shower of gold; forgetful that the shower of gold did not make Danae what she was when she attracted the discriminating gaze of the Thunderer. Let our patronage-hunters in the plastic art bear that in mind of the frail Danaë, and let them also consider whether the allegory might not with truth be carried a little further, and the inducement of gold be shown to lead to the ruin of art, as it did of Danaë. But, indeed, as to the complaint of want of money-patronage, we consider it peculiarly uncalled-for as regards sculpture, which, having reference to the number of hands employed in it, is more lavishly rewarded than any other branch of art, to say nothing of the miserable crumbs which fall to the share of many more intellectual pursuits. St. Paul's and Westminster Abbey, in both of which whole mines of wealth have been distributed amongst the hewers of stone and the moulders of clay, are witnesses to what we assert. The squares, too, each has its costly bronze or marble occupant. The Nelson monument was no mean job after its kind—whilst the Triumphal Arch comes like the rod of Aaron to swallow up all the jobs of the preceding half century. In short, is there a site of ground throughout the country where a testimony to departed worth can possibly be put up, which will not one of these days be so occupied? Is there a single issue of the *Times* without a testimonial subscription list? The ancient Greeks, it is true, had their testimonial-mania; but their tributes were to gods, and heroes almost deified; and the men employed in producing these still unequalled works, brought to bear all the resources of their art in typifying, rather than embodying, the principal subject in the most perfect and appropriate forms a deep study of the human figure could suggest, with only such an amount of accessorial decoration as might be absolutely necessary to indicate the character and state of the personage represented. We, having no plurality of gods to worship, no old historic heroes to engross our wonder and exhaust the resources of our art, too generally content ourselves with mere imitations of gross humanity, individualising nature in her thousand imperfect manifestations, and completing each new portraiture with the addition of details which high art would disdain to notice. Upon this point we find some appropriate observations, so judiciously and so ably stated by Sir C. L. Eastlake, P.R.A., in a paper inserted in the appendix to the Third Report of the Commissioners on the Fine Arts (1844), that we readily quote them, in preference to enlarging upon the subject in weaker language of our own:—



THE GREEK HUNTSMAN.—J. GIBSON.

"The *colour* of white marble, which, it appears, may sometimes increase the illusion of drapery, is not the only quality by means of which some substances may resemble nature more literally than the marble flesh can. The qualities of smoothness, of hardness, of polish, of sharpness, of rigidity, may be perfectly rendered by marble. It is not easy to conceive a greater accumulation of difficulties for a sculptor aiming at the specific style of his art to contend with, than the representation of a personage in the modern military dress. The smoothness and whiteness of leather belts, and other portions of the dress, may be imitated to illusion in white and smooth marble. The polish, the hardness, and sharpness of metal, and the rigidity even of some softer materials, are all qualities easily to be attained in stone; yet the white marble flesh is required to be nearest to nature, though surrounded by rival substances that, in many cases, may become absolute fac-similes of their originals. The consequence of the direct and unrestrained imitation of the details in question is, that the flesh, however finished, looks petrified and colourless, for objects of very inferior importance, even to the buttons, are much nearer to nature. The objection to these details, from their unpleasant or unmeaning forms, is here left out of the account.

"The boldness with which the ancient sculptors overcame similar difficulties is remarkable. Thus, to take an extreme case, *rocks*, which in marble can be easily made identical with nature (thereby betraying the incompleteness of the art in other respects), are generally conventional in fine sculpture; witness the basso-relievo of Perseus and Andromeda, and various examples in statues where rocks are introduced for the support of the figure. In order to reduce literal reality to the conditions of art, the substance, in this instance, is, so to speak, uncharacterised: the same liberty is observable

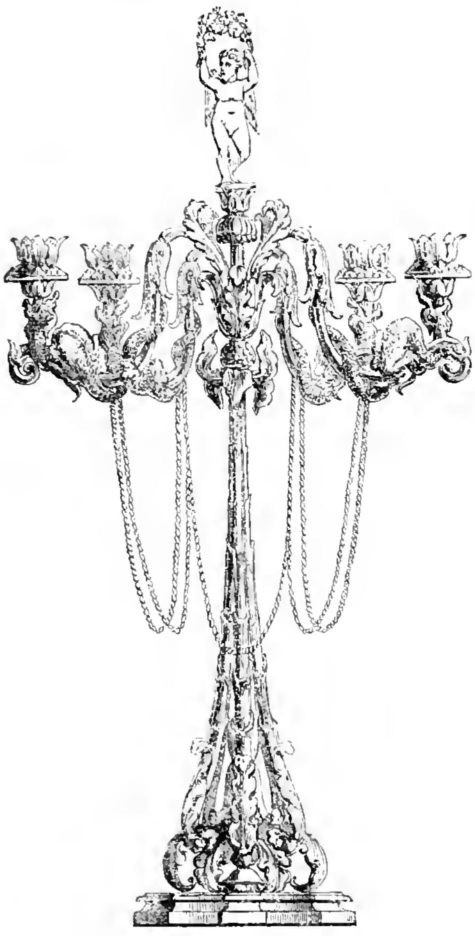
in sculptured armour as treated by the ancients; sharpness is avoided, and the polish does not surpass, sometimes does not equal, that of the flesh. In like manner, steps, or any portions of architecture, are irregular, and not geometrically true in their lines and angles: on a similar principle, probably, the inscriptions on the finest antique medals are rudely formed; for it cannot be supposed that the artists who could treat the figures and heads so exquisitely, could have been at a loss to execute mechanical details with presision."

Now mark the contrast between the past and the present. Whilst the ancient sculptors were so engrossed with the diviner part of their work, the living figure, that they studiously avoided the too accurate delineation of subordinate objects, whether of decoration or adjunct, lest by comparison these should detract from the *vraisemblance* of the former; modern sculptors, beginning too often with the most humble attempts at portraiture, and other branches of imitative art, are content to atone for the lamentable shortfallings of the living part of their subject by the slavish copying of a button-hole, or a leather strap, or worsted hose. And have they not their admirers! Undoubtedly they have, and the name of them is legion—a public who will stare and wonder at the workmanlike finish of a helmet or a jack-boot, but have no appreciation of the sublime inspiration evinced in the various speaking and all but breathing relics of the antique.

UNA AND THE LION.—JOHN BELL.

It would appear, therefore, that, as between artists and the public there are faults on both sides, which, when they both begin to understand what is worthy of them, may gradually be removed. With these general observations, we now proceed to remark upon some of the works in the Sculpture Gallery of the Hyde Park Exposition.

The Sculpture Room was a small, ill-lighted, and overcrowded apartment, which, being entered through the gaudy Mediæval Court, pointed significantly to the retrograde path of art. The first object that struck us in the centre, at the extreme end, was a statue in marble of her Majesty, by Francis, which unhappily illustrated many of the errors of judgment and of taste we have suggested in the preceding paragraphs. The head is as singularly devoid of dignity as the figure is of grace, being indeed completely buried in the cumbersome trappings of Royalty; the artist having made no effort to contend with the natural heaviness of his material, by indicating through it the bearing of the limbs. On either side of this figure were two other productions by different artists, which afford examples, though not in equal degree of turpitude, of the diversion of the sculptor's art to subjects altogether unworthy of and inappropriate to it. One of these, which is by Mr. T. E. Jones, presented a very rough, but not very truthful, portrait of a Shetland pony, upon whose back two children are seated, whilst a third, scrambling on the ground, offers to feed it; a full-grown Scotch deer-



BRASS CANDELABRUM.—POTTS.

CANDELABRA, BY POTTS.

The brass and bronze work exhibited by Potts, of Birmingham, was justly ranked with the very best things of their kind, and have obtained for the producer a Prize Medal, with, in addition, a memorandum of "special approbation;" an honour, however, which he has repudiated. The two candelabra which we engrave, one of which is called the "Stork Candelabrum," are very elegant and tasteful in design.

THE STORK CANDELABRUM.—POTTS.

hound completes the already redundant group, which is obviously borrowed from Landseer, and spoiled. The other subject referred to is Mr. Bell's "Una, as Purity." The female figure, which is of a common-place character, is seated upon a shaggy lion, which has evidently been the chief object of the artist's solicitude. In order to distract attention still further from what ought to be the principal subject, Mr. Bell has decorated the king of the forest with a wreath of flowers, elaborately finished, and in remarkably high relief, the coronals picked out with yellow, which not only covers the neck and mane, but extends behind the female figure round to the animal's stern, upon which a dove is perched, whilst a single rose occupies a prominent position in the foreground of the base. Could the force of ingenuity go further to destroy the "purity" of a composition? In another part of the room, Mr. Bell's "Babes in the Wood" exhibits a similar instance of mischievous ingenuity: heaps of leaves, and a branch of a tree, upon which is perched a bird, being prominent above the principal objects, and breaking the graceful outline which in works of sculpture is a condition essential to a beauty.

Still more glaring instances of ignorance of the higher purposes and legitimate resources of the sculptor's art are to be found in Sharp's plaster group, "Christ's Charge to Peter," where the sheep and a bunch of keys are the actualities of the piece, the figures exhibiting a lamentable ignorance of the structure of the human body; and in "Christ bearing his Cross," where the sculptor has introduced an absolute wooden cross, some seven or eight feet long, which could not have been carried in the way he has placed it in the arms of his figure. We notice these productions, not for any pleasure of fault-finding, but for the purpose of emphatically pointing out to the thousands who have visited this room, and who may read these lines, what to avoid.

Against the walls are two large bas-reliefs by Mr. Carew, which exhibit considerable merit of intention, though with much of the quality and weakness, and, perhaps, we might add, carelessness in the execution. The first in importance is "The Descent from the Cross," of which it is remarked, that, although it covers a very large space, the interest of the scene is confined to a very limited portion of the base. The upper part is occupied by the cross, and an indication of rays of light, which, pephaps, the artist designed to turn to effective account on the execution of the work in bronze or marble, but which, it must be obvious, only colour or gilding could realise. Mr. Carew has shown less anxiety to find subject-matter to fill his ground than Rubens, in his great work, on the same subject, though the latter had all the resources of his florid pencil to fly to, and could have occupied the whole of the upper part of his canvass with aërial effects, had he been so minded. In the principal group of Mr. Carew's work, the head of Christ stands out with remarkable effect, the light falling upon it so as to give it all the palor of death. The heads of the Apostles are of less merit, and dissapoint us by the utter want of sympathy and veneration which they betray for the precious burthen in their hands. They are all looking off the picture, in a downward direction, as if calculating the steps by which they are to descend in safety. The female figures, also, which are a good deal scattered, appear to be each so overwhelmed with her own particular grief, that they none of them show any solicitude about the divine object which has brought them together, and no sympathy for one another. The boy on his right is an intruder. The consequence is a want of *ensemble*, to say nothing of a want of truthfulness to nature, which must considerably militate against the success of the piece. Mr. Carew has very abundantly draped his figures, but he he has done it in that broad massive style, which is sometimes very effective in painting, but which, is always heavy in sculpture, and suggests the suspscion that it has been resorted to to avoid the trouble of going into anatomical details. The "Baptism of Christ," Mr. Carew's other bas-relief, is less elaborate and ambitious than the preceding work, consisting, as it does, of two figures only. Still, in these two, we perceive a want of judjment—the build of the limbs being brawny, not to say heavy, a cheracter, quite out of keeping with the personages represented, while here is little attempt at dignity to realise the sublime poetry of the scene. Mr. Carew is more at home in his smaller work, a plaster figure of "Whittington." The face is very expressive, as in the act of listening to the distant sound of Bow bells. In the costume, however, there is the same shirking of difficulties, the whole figure being buried in coat and trousers of the thickness and unyeilding texture of leather.

Mr. Evan Thomas's bas relief, "The Spirit of Science unveiling Ignorance and Prejudice," has many pleasing and creditable features; as, for instance, the dazzled and awe-struck expression of "Ignorance," at the moment of being unveiled before the light of truth, and the sitting figure of "Prejudice," wrapped in a thick and impenetrable cloak beneath. The rest is rather commonplace, particularly the figures of the two youths receiving instruction, on the other side of the picture, and who do not sufficiently balance the composition.

In the "Greek Hunter," by John Gibson, which is exhibited by its owner, Lord Yarborough, we have no crude imitation of nature, which artists often copy without understanding what nature is, or should be; here is evinced a mature study, a ripe appreciation of the best classic models, which after all, in the present state of art, are the best and surest types of excellence. In *physique*, the model is well chosen for the subject, nervous, wiry, and athletic. The muscular development is carefully studied, and without exaggeration: the intent and animated expression of the face is true to the occasion; and the general finish of the flesh texture—mark alone that above the instep of the right foot—approaches perfection. We need not despair of excellence in the higher walks of art, when such works as this come from British hands.

AWARDS.—THE COUNCIL MEDALS.

UNCLASSIFIED COUNCIL MEDALS.

HIS ROYAL HIGHNESS PRINCE ALBERT, for the original conception and successful prosecution of the idea of the Great Exhibition of 1851, joint medal with that granted for the Model Lodging House in Class VII.

Chamber of Commerce, Lyons, for the collection which it exhibits, in which is shown the general progress made, through their exertions in the silk manufactures at Lyons.

East India Company, the Hon., for the very valuable and extensive collection, illustrating the natural resources and manufactures of India.

Egypt, the Pacha of, for the very valuable and extensive collection, illustrating the manufactures and natural resources of Egypt.

French Minister of War, for the part taken by him in exhibiting the valuable collection of raw productions from Algeria.

Spain, the Government of, for the valuable and extensive collection of raw products, showing the natural resources of Spain.

Tunis, the Bey of, for the very valuable and extensive collection, illustrating the manufactures and natural resources of Tunis.

Turkey, the Government of, for the valuable and extensive collection of raw products, showing the natural resources of Turkey.

THE COUNCIL MEDAL.

JURY I.—MINING AND MINERAL PRODUCTS.

Berard and Co., process for washing and purifying coals.
Brockedon, W., Cumberland lead, condenser and blocks.
Estivant Brothers, brass of superior quality.
Gutler, W., treatment of arsenical ores, and the extraction of gold from them.
Kleist, Baron Von, iron of superior quality and manufacture.
Krupp, Fried, cast steel of superior quality.
Pattinson, H. L., process of treating lead ores, and separating silver from lead.

JURY II.—CHEMICAL AND PHARMACEUTICAL PRODUCTS.

Guimet, J. B., artificial ultramarine.
Larderel, Count F. de, boracic acid, and method of preparing it.
Longmaid, W., Class I., process for treating copper pyrites with common salt.
Prat and Agard, salts of potash, and other products of sea water.

JURY III.—SUBSTANCES USED AS FOOD.

Borden, Gail, jun., for the preparation called "meat biscuit."
Darblay, —, jun., for the gruaux and household flour, of very fine quality, obtained by his novel and economical process.
Grar, N. and Co., for the sugar obtained from beet-root by the Barytic process.
Lawson, Peter, and Son, for their admirably displayed, very complete, instructive, and scientifically-arranged collection of the vegetable products of Scotland.
Masson, E., for dried vegetables prepared by his new and economical process.
Serret, Hamoir, Duquesne, and Co., for beet-root sugar, procured by a method, the result of which is to save valuable substances previously lost in the manufacture, and consequently to reduce materially the price of the sugar itself.

JURY IV.—SUBSTANCES USED IN MANUFACTURES.

Belfast Flax Improvement Society, The Royal, the persevering and successful efforts to improve the quality of the fibre of flax, as illustrated by the series of specimens exhibited.
Graux, Jean Louis, de Mauchamp, the origination of a new and valuable quality of wool, giving to the variety of merino the best quality for combing, and possessing increased strength, brilliancy, and fineness of fibre.
Grenet, L. F., a new and improved mode of obtaining a pure, inodorous, and colourless gelatine from the refuse parts of animals, and valuable and diversified modes of applying the materials, as illustrated in the collection exhibited.
Mercer, John, Class XVIII., the process of modifying the fibre of cotton by the action of caustic alkali, whereby its physical and chemical properties are altered and improved in a most remarkable manner.
Popelin Ducarre, for the novel and economical mode of preparing vegetable charcoal from the small branches of trees, and from annual plants.

JURY V.—MACHINES AND MECHANISM.

Appold, J. G., a centrifugal pump, with curved veins.
Cockerill, J., pair of 140-horse power vibrating cylinder engines for river navigation; a locomotive engine; an oscillating cylinder 3-horse power land engine; tubular boiler; a vertical cylinder 16-horse power land engine. The award is made for the whole.
Crampton, T. R., two passenger locomotive engines.
Dunn, T., a railway traversing frame.
Fromont and Son, a double turbine.
Penn, John, and Son, two pair of compact marine engines, of light construction, for small vessels.

JURY VI.—MANUFACTURED MACHINES AND TOOLS.

Barlow, A., jacquard loom, with two cylinders, simultaneously raising and lowering the suspended wires.
Cail and Co., vacuum apparatus for the manufacture of sugar.
Donisthorpe, G. E., double wool-combing machine.

Donkin, B., and Co., paper machinery.
Dick, D., various engineer's tools and presses.
Fairbairn, W., and Sons, riveting machine, and a corn-mill.
Heckmann, C., vacuum apparatus for the manufacture of sugar.
Hermann, G., a set of chocolate machines.
Hick, B., and Son, mill gearing, radial drill, engineer's machine tools, improved mandrills, portable forges.
Hibbert, Platt, and Sons, a complete series of machines employed in the cleaning, preparation, and spinning of cotton, showing the whole process, to the weaving inclusive.
Lawson, S., and Sons, numerous machines employed for the preparation of flax.
Mason, J., woollen combing-machine, also slubbing and roving frames.
Maudslay, Sons, and Field, coining press, acting by an eccentric.
Mercier, A., and Co., machinery for carding and spinning wools.
Nasmyth, J., and Co., steam hammer.
Parker, C. E., and C., power-loom for weaving sailcloth.
Pontifex and Wood, vacuum apparatus for the manufacture of sugar, in copper and brass.
Reed, T. S., and Co., new power-loom for weaving fringes without shuttles.
Risler, M., Fils, Epurator, a machine for cleansing and preparing cotton for spinning.
Sharp Brothers and Co., large double lathe for railway wheels, slotting machine, and other engineer's machine tools, also a beautifully-constructed ring and traveller throstle.
Uhlhorn, H., coining press.
Whitworth, J., and Co., a large collection of engineers' machine tools of all kinds, screw stocks, standard gauges, and a knitting machine; also his machine for measuring less than the 200,000th part of an inch.

JURY VII.—ARCHITECTURE AND BUILDING.

His Royal Highness Prince Albert, model lodging house. Joint medal to that granted for the original conception and successful prosecution of the Exhibition of 1851.
Fox and Henderson, great building, for the execution.
Paxton, Joseph, great building, for the design.

JURY VIII.—NAVAL ARCHITECTURE, MILITARY ENGINEERING, &c.

Admiralty, for hydrographic charts, and for the models of the ships constructed by them.
Département des Cartes de la Marine, hydrographic surveys, and maps of France, Algeria, Africa, and Corsica.
Dépôt de la Guerre à Paris, great topographical map of France.
Geological Survey Department of Great Britain, Class I., for their geological surveys and maps of the United Kingdom.
Duke of Northumberland, for having caused a large number of models of life-boats to be designed, with the view to obtaining the best form of boat for the preservation of life and property in cases of shipwreck.
Ecole des Mines à Paris, geological map of France.
Ordnance Department of England, for the illustrations of the great Ordnance surveys of Great Britain, for the copper-plate etchings, and electrotype process.
Military Topographical Department of Austria, for their survey and detailed maps of the country in and around Vienna, and of Italy.
Sir W. Snow Harris, for his system of lightning conductors attached to the masts and hulls of ships, which have been for several years in general use in the navy, as a means of preserving life and property from the effects of lightning.

JURY IX.—AGRICULTURE AND HORTICULTURE.

Busby, W., two or four horse plough, horse hoe on the ridge, ribbing corn-drill, and cart.
Croskill, W., Norwegian harrow, meal-mill, cart, clod crusher, and gorse bruiser.
Garrett and Sons, horse-hoe, general purpose drill, 4-row turnip drill on the flat, improved hand barrow drill for grass seeds, steam-engine, and thrashing machine.
Hornsby and Sons, corn and seed-drill, drop drill, 2-row turnip drill on the ridge, oil-cake bruiser, steam-engine.
M'Cormick, C. H., reaping machine.

JURY X.—PHILOSOPHICAL INSTRUMENTS.

Bain, A., electric telegraph.
Bakewell, F., copying electric telegraph.
Bond, Wm. and Son, for the invention of a new mode of observing astronomical phenomena, &c.
Bourdon, E., for the invention of metallic barometers, and for his manometers.
Brett, J., printing telegraph.
Brooke, C., for the invention of a means of self-registering natural phenomena, by photography.
Buckle, S., Class XXX., for his photographs on paper.
Buron, for his good telescopes, the object glass being of rock crystal.
Chance Brothers, Class XXIV., a disc of flint glass, 29 inches diameter.
Claudet, A. F., for his several inventions based upon experiments in the practice of photography; and for his non-inverted pictures.
Daguet, T., for the superiority of glass for optical purposes, good specific gravity, clear; crown glass as clear as flint.
Delcuil, L. J., for his balance air-pump; and for the invention of an arrangement to keep the charcoal points in electric light at a constant distance.
Dollond, G., for atmospheric recorder, by means of which the readings of the barometer, the ... of the thermometer evaporator, fall of rain, direction of the wind, its strength, electric state of the air, &c., are simultaneously registered.
Dubosq Soleil, J., for a very ingenious heliostat, on a new construction, by Silberman; the invention of an apparatus for fixing the charcoal points for electric light; a saccharometer of delicate structure and much ingenuity, and an elegant and novel instrument, by Brevais, for exhibiting the phenomena of polarized light.
Dunin, Count, E., for the extraordinary application of mechanism to his steel expanding figure of a man.
Froment, G., for the goodness of the work of his theodolites and divided metre.
Gonnella, Professor T., planometer, a machine for measuring plane surfaces.
Griffith, J., for his barometer, with a vacuum capable of complete restoration by an air-trap at the top.
Henley, W. T., for his convenient and ingenious application of magnetic electricity to the purpose of electric telegraphs.
Logeman, W. M., for the excellence of the magnets shown by him.
Martens, F., for his talbotypes on glass by the albuminous process.
Merz and Sons, equatorial, combining cheapness with excellence of workmanship.
Newman, J., for the originality, excellence, and perfection of his air-pump and self registering tide gauge.
Oertling, L., for very delicate large and small balances.
Quennessen, a platina alembic, to hold 250 pints, all in one piece, without solder or seam, &c.
Ross, A., for great improvements in microscopes, and for the solidity of structure, good mechanism, and distribution of strength, great size, &c., of his large equatorial.
Ross and Thomson, Class XXX., for great improvements in photography.
Siemens and Halske, electric telegraph.
Smith and Beck, for excellence of their microscopes.
Taurines, dynamometer.
Vidie, for the invention of the aneroid barometer.

JURY Xa.—MUSICAL INSTRUMENTS.

Boehm, T., for important scientific improvements of the flute, and the successful application of his principles to other wind instruments.
Ducroquet, P. A., for his application of the pneumatic lever to a church organ.
Erard, P., for his peculiar mechanical actions applied to pianofortes and harps.
Gray and Davidson, for their invention in organ building, of a new method of connecting the great organ with the swell organ by means of a pedal and of a new stop called the keraulophon.
Hill and Son, invention of a stop of great power, and for their mode of shifting the stops by means of keys.
Sax, A., for his invention of several classes of wind instruments in wood and metal.
Vuillaume, J. B., for new modes of making violins, in such a manner that they are matured and perfected immediately on the completion of the manufacture, thus avoiding the necessity of keeping them for considerable periods to develope their excellencies.
Willis, H., for his application to organs of an improved exhausting valve to the pneumatic lever, the application of pneumatic levers in a compound form, and the invention of a movement in connexion therewith for facilitating the drawing of stops either singly or in connexion.

JURY Xb.—CLOCK WORK.

Dent, E. J., for his large turret clock, on account of the combination of strength and accuracy of time-keeping attained in it, which are also accomplished by a cheaper mode of construction than in other turret clocks of high character.
Japy Brothers, clock and watch movements made by machinery, much cheaper than by any other movement and equally good.
Lutz, C., for his watch balance springs, which were submitted by the jury to the test of stretching out and heating without affecting their form.
Wagner, J., Neveu, for his clock with a continuous motion for driving telescopes, and for his collection of turret-clocks, which on the whole display great fertility of invention.

JURIES XI.—COTTON MANUFACTURES. XII. WOOLLEN. XIII. SILK AND VELVET. XIV.—FLAX AND HEMP.

No Council Medal.

A large number of the smaller medals were awarded.

JURY XV.—MIXED FABRICS.

Deneirouse, E., Bois-Glavy, and Co., the discovery of a new and important process in the production of elaborate designs.

JURY XVI.—LEATHER, SKINS, &c.

No Council Medal.

JURY XVII.—PRINTING, &c.

Vienna, Imperial Court and Printing Office, novelty of invention, and the number of new combinations in the art of typography.

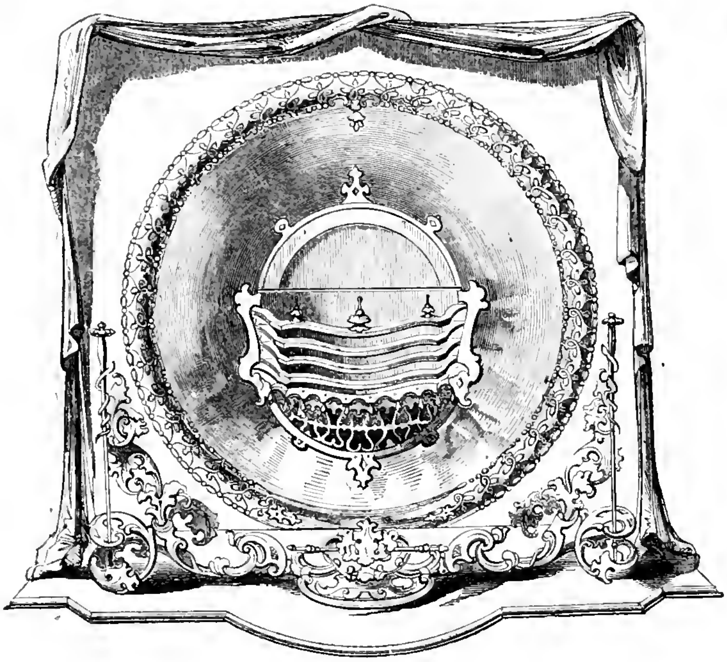
JURY XVIII.—DYED AND PRINTED FABRICS.

No Council Medal.

JURY XIX.—TAPESTRY, LACE, &c.

Ball, Dunnicliffe, and Co., velvet and Simla lace, being new patented fabric

suitable for shawls, dresses, and for various ornamental and useful purposes, and of great commercial importance, also for imitation Valenciennes lace, black and white point tulle, of great merit.



STOVE.—JOBSON AND CO., SHEFFIELD.

Gobelin Tapestry, French Government manufactory of, for originality and beauty of design of the different specimens exhibited for furniture, and the extraordinary excellence of execution of most of the productions exhibited.

Jury XX.—Articles of Clothing.

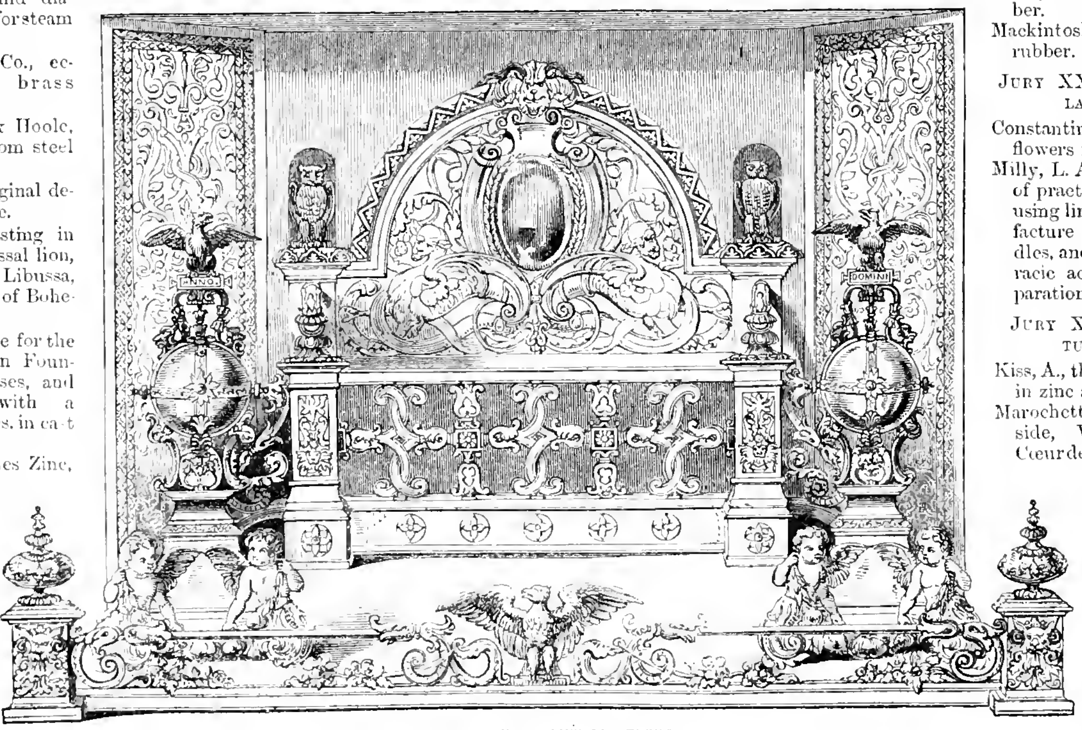
No Council Medal.

Jury XXI.—Cutlery and Tools.

Spear and Jackson, Class XXII., for exhibition of circular saws, and particularly one 60 inches in diameter, of marked and very superior excellence, manufactured by a process of peculiar merit, the result of a novel application of mechanical ingenuity, recently effected by themselves.

Jury XXII.—Iron and General Hardware.

André, J. P. V., for iron fountain in nave, and the design of the alligator and fish fountain.
Aubanel, J., casting of animals, and gilt cast iron door.
Barbedienne, F., and Co., joint medal with Class XXVI., sculpture in metal, bronzes, &c.
Coalbrook Dale Company, cast iron statues, new method of bronzing steel grates, and diamond flooring for steam engines.



STOVE.—FEATHAM, CLIFFORD STREET.

Hardman and Co., ecclesiastical brass work.
Hoole, Robson, & Hoole, for drawing-room steel grates.
Matifat, C. S., original designs in bronze.
Miller, Ford, casting in bronze of colossal lion, and statues of Libussa, and George I. of Bohemia.
Minister of Trade for the Royal Prussian Foundry, three vases, and candelabra, with a group of figures, in cast iron.
Societé des Mines Zinc, de la Vieille Montagne, specimens of zinc castings.
Stuart and Smith, drawing-room grates on Sylvester's patent, and the novel application of a revolving canopy invented by Laurie.
Winfield, R. W., brass foundry work, and metallic bedstead, with taper rolled pillars, and chandeliers.

Jury XXIII.—Precious Metals and Jewellery.

Elkington, Mason, and Co., artistic application of the electrotype.
Froment, Meurice, centre-pieces, representing globe surmounted by deities.
Garrard, R. and S., and Co., artistic plate and jewellery.
Gueyton, A., the variety he exhibits, and his electro-plating.
Hancock, C. F., originality and taste in his exhibits.
Hunt and Roskell, vase in repoussé by Vechti.

Jury XXIV.—Glass.

Mayes, M., novelty of chemical application.

Jury XXV.—Ceramic Manufactures.

Minton, H., and Co., new application and beauty of design.
Sèvres Manufactory, high art.

Jury XXVI.—Furniture Decorations.

Barbedienne and Co., ebony bookcase, mounted with bronze. Joint medal with Class XXII.
Delicourt, E., paper hangings.
Fourdinois, A. G., carved sideboard of walnut-wood.
Leistler, C., and Son, carved furniture in four rooms.
Lienard, M. J., clock case and other articles.

Jury XXVII.—Mineral Manufacture.

Barberi, The Cavaliere, a table in Roman mosaic.
Demidoff, Messrs., malachite manufactured into various articles of furniture and decoration.
Society for Improving the Condition of the Labouring Classes, sundry improvements in the construction of bricks, and the improvements of habitations for labouring classes.
Minton, H., and Co., encaustic tiles. Joint medal with that given to H. Minton and Co., in Class XXV.

Jury XXVIII.—India Rubber, &c.

Gutta Percha Company, The, gutta percha.
Goodyear, C., India rubber.
Mackintosh and Co., India rubber.

Jury XXIX.—Miscellaneous.

Constantin, J. Marques, flowers in cambric.
Milly, L. A. de, invention of practical methods of using lime in the manufacture of stearic candles, and the use of boracic acid in the preparation of wicks.

Jury XXX.—Sculpture, &c.

Kiss, A., the Amazon, cast in zinc and bronzed.
Marochetti, Baron, Outside, West, Richard Cœur de Lion, in plaster.
Pradier, J., Phryne, in marble.
Wyatt, the late Richard J., Main Avenue, East, Glycera, in marble.

ORNAMENTAL STOVES.

England has certainly distanced all competitors in this important branch of hardware, including the manufacture of stoves, fenders, &c. In taste of design, crispness of casting, and colour of the metal, our principal manufactures, both in Sheffield and London, leave nothing to be desired. The stove by Jobson and Co. is a very elegant production, after the new semi-spherical fashion, which has peculiar properties of throwing out heat.—Featham, of Clifford Street, has several choice and curious works in the Elizabethan and medieval styles; not the least so is this very handsome stove, of admirable workmanship highly polished, and enriched with or-molu.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

MODEL HOUSES FOR THE LABOURING CLASSES, EXHIBITED BY PRINCE ALBERT.

PRINCE ALBERT'S MODEL HOUSES FOR FAMILIES.

FEW who visited the wonders of wealth and industry exhibited within the Crystal Palace, can have passed unnoticed a small block of neat, cheerful-looking houses, newly-erected, which stand at the side of the drive, a little west of the Barracks, and not far from the south entrance of the Great Exhibition. These were the philanthropic work of the Prince Consort; who, in the midst of the splendid attractions of a court, and the pursuits of science and art in their higher branches, has not disdained to give a careful consideration to the condition of the hardworking artisan, in the humbler fields of industry. It was an intervention which was much wanted, which humanity had loudly called out for in vain, as all know who have inspected the abodes of the industrious and poorer classes, not only in the crowded city, but in the rural village; for neglect for the sufferings of others, and a niggardly denial of the essentials of health, cleanliness, and comfort, have been equally manifested in the town and provincial districts throughout the country.

This has long been a crying evil, but too long only heard as the wail of the lowly and defenceless, and dependent classes, which found no way into the ears, much less into the hearts, of those who should have heard their complaint, and solaced their rugged course of life, by all means reasonably within their power. It was not until half-a-dozen years ago that the sanitary condition of the poorer classes was forced upon the attention of the Legislature and the Government, as a matter worthy of public consideration; and the pleadings of the humane and the warnings of the wise having been fearfully supported and confirmed by that providential scourge, the cholera, a Board of Health was appointed, with certain powers, which have already been put in course of carrying into operation in nearly two hundred populous districts, with already very important and salutary results. The disclosures made by the Inspectors appointed by this Board, as to the wretched home accommodation of the poorer classes, which existed as a rule, with scarcely any exception, throughout the kingdom; the utter want of drainage, of water supply, of the ordinary precautions for the means of personal cleanliness, and the denial of the breath of life, through a wholesale and almost wilful neglect of ventilation, were such as to startle many even of those inhabitants of the very towns in which these flagrant evils existed. The consequences upon the health of communities were also shown to be most serious, excessive mortality existing in some

places to the extent of being *two* and *three* fold what, with ordinary sanitary precaution, it might fairly be expected to be; two and three fold what it actually was in some other districts more happily circumstanced.* Added to this, the charge upon the public purse in the cases of sickness, of widows and orphans left to burthen the parish, of labour lost by temporary incapacity during illness; and a case was made out which convinced all cool and dispassionate individuals that it was the wealthy who had a direct pecuniary interest in the health of the poor; and that as regarded health itself, they were not altogether exempt from participation in the sufferings of their fellows—the parting breath of the dying pauper not unfrequently poisoning the atmosphere of his richer neighbour.

Upon this subject, also, contemporaneously with tho inspections of the Board of Health, the correspondents of some of the morning papers—more particularly the *Morning Chronicle*—lent their useful aid, and brought in a vast mass of corroborative evidence, thus giving increased publicity to facts already too well established in professional and official quarters.

The Journal last mentioned states, in a recent article:—"A couple of years ago our correspondents in the metropolitan, agricultural, and manufacturing districts, painted a succession of the most melancholy pictures of the wretched and degrading tenements in which the poor are lodged, both in town and country—in London alleys and manufacturing suburbs, and in rural lanes. The dens of lodging-houses in the great towns—the cellars and garrets where thousands of unhappy creatures are penned, sometimes three and four in a bed, and very often without the least distinction of sex, have been amply described in letters portraying the east end of London and the huge and swarming towns of Lancashire; while the hovels and dilapidated cottages which stud the agricultural districts, particularly in the south and west of England, have been sketched in colours just as dismal. Turning back to our files of a couple of seasons ago, we find column after column, and letter after letter, devoted to the exposition of the miserable, the worse than savage condition of the dwelling accommodation of a great portion of the peasantry of England. We read again and again accounts of cottages crumbling into ruin—the cold wind blowing in at every chink and cranny—the rain sopping the mud flooring—the dunghill overflowing, and sending its fœtid juice in streams across the threshold. We read of bed rooms immediately beneath the putrid and leaking thatch—of bed-rooms in which a whole family, father, mother, adult and infant children, young men and young women, all slept together like so many pigs in a sty; of cottage accommodation, in fact, which made us wonder how there was any natural decency and feeling, or human restraint of behaviour left amid a great proportion of our rural population. In many parts of England it is perfectly clear that the people are not better, perhaps they are worse, lodged than they were under the Plantagenets and the Tudors. No dwelling can by possibility be worse than a ricketty cottage, open to every wind of heaven, admitting rain through roof and wall, a dunghill piled before the door, and men and women, children and parents, lying down to sleep together on ragged mattrasses and straw in the same fœtid, unventilated room. Indeed we suspect that in many cases the condition of our rural population is even worse than it was in the days of the most despotic of our early Norman kings, because a greater proportional amount of rent is squeezed out for accommodation in nowise better than that possessed by the 'villains' and the 'varlets' of the good old times. Rents have risen, in fact, while cottages have not improved; and, worse even than that, as our agricultural correspondents have proved, population has in many districts increased enormously, and cottages not at all. It is to be earnestly hoped that a change in this respect is now at hand, nay, that it has already begun. The beautifully arranged and substantially constructed cottages in Hyde Park, to say nothing of the model lodging-houses in various parts of London, prove that good houses can now be erected as cheaply as bad ones, and that the building of such dwellings may be made to form at once one of the safest, most profitable, and most philanthropic means of investing money. Those who would be inclined to sneer at the juxtaposition of philanthropy and profit in the same sentence, know very little of human nature. Men naturally like to get as much for their capital as they can—society would not hold together unless such were the case; and men also—the monetary advantages being equal—just as naturally prefer realising these advantages through supplying the means of comfort and contributing to the well-being, rather than through a bare and insufficient ministering to the actual physical requirements of their fellow creatures. The new houses erected in Hyde Park are calculated to pay 7 per cent. on the outlay—a very handsome return—and they are calculated, at the same time to rear a population brought up in decent household comforts, adapted alike to their physical and moral well-being."

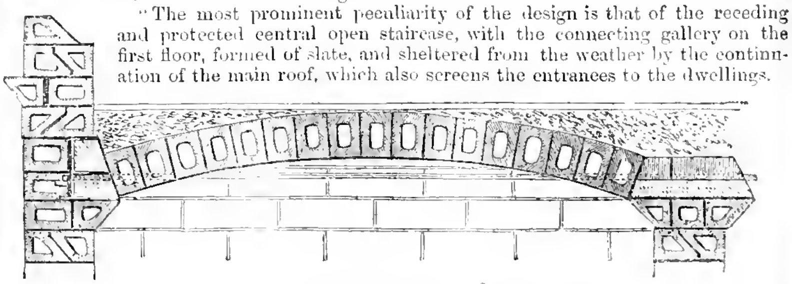
The model house in Hyde Park consists of four dwellings, compactly put together—two on the ground, two on the first floor; the latter attained by an outside staircase, which gives a feature of architectural beauty to the elevation. Each dwelling (they are all *fac-similes*) contains a general sitting-room and kitchen, entered by a lobby (an essential requisite), two small bed-rooms for the male and female branches of the family, a large bed-room for the parents and the younger children, a scullery, and a decent water-closet. The whole of the rooms are full of cupboards and such conveniences; the building is fire-proof, there being no particle of wood in the whole structure; water is laid on; a passage to a general dust-hole communicates with all the sculleries; the kitchen ranges are models of economical neatness; ventilation has been carefully attended to on the most scientific principles; the walls are built of a peculiar species of hollow bricks, which are cheaper than the old ones, and have another most important requisite, that of deadening sound—and altogether the cottages are models of the most ingenious compactness and simple comfort.

The building before us has been designed and practically superintended by Mr. Roberts, the honorary architect to the excellent "Society for Improving the Condition of the Working Classes," the President, Prince Albert, having supplied tho means, and obtained the advantageous site on which it stands.

The following additional particulars are from those drawn up by the architect—

"In its general arrangement the building is adapted for the occupation of four families of the class of manufacturing and mechanical operatives, who usually reside in towns, or in their immediate vicinity; and as the value of land, which leads to the economising of space, by the placing of more than one family under the same roof, in some cases, renders the addition of a third, and even of a fourth story desirable, the plan has been suited to such an arrangement, without any other alteration than the requisite increase in the strength of the walls.

"The most prominent peculiarity of the design is that of the receding and protected central open staircase, with the connecting gallery on the first floor, formed of slate, and sheltered from the weather by the continuation of the main roof, which also screens the entrances to the dwellings.



SPECIMEN OF HOLLOW BRICK-WORK.

"The four tenements are arranged on precisely tho same plan, two on each floor.

"The entrance is through a small lobby, lighted from the upper part of the door.

"The living room has a superficial area of about 150 feet, with a closet on one side of the fireplace, to which warm air may be introduced from the back of the range; over the fireplace is an iron rod for hanging pictures; and on the opposite side of the room a shelf is carried above the doors, with a rail fixed between them.

"The scullery is fitted up with a sink, beneath which is a coal-bin of slate; a plate-rack at one end, drained by a slate slab into the sink, covers the entrance to the dust-shaft, which is inclosed by a balanced self-acting iron door. The dust-shaft leads into a closed depository under the stairs, and has a ventilating flue, carried up above the roof. The meat safe is ventilated through the hollow brickwork, and shelves are fixed over the doors. A dresser flap may be fixed against the partition.

"The sleeping apartments, being three in number, provide for that separation which, with a family, is so essential to morality and decency. Each has its distinct access, and a window into the open air; two have fireplaces.

"The children's bed-rooms contain 50 feet superficial each, and, opening out of the living room, an opportunity is afforded for the exercise of parental watchfulness, without the unwholesome crowding of the living room, by its use as a sleeping apartment.

"The parents' bed-room, with a superficial area of about 100 feet, is entered through the scullery—an arrangement in many respects preferable to a direct approach from the living room, particularly in case of sickness. The recess in this room provides a closet for linen; and a shelf is carried over the door, with a rail fixed beneath it—a provision which is made in each of the other bed rooms.

"The water-closet is fitted up with a Staffordshire glazed basin, which is complete without any wood fittings, and supplied with water from a slate cistern, in common, of 160 gallons, placed on the roof over the party and staircase walls. The same pipes which carry away the rainwater from the roof serve for the use of the closets."

With reference to the cost of construction, the following statement is made:

"In most parts of England the cost of four houses, built on the plan of this model structure, with ordinary materials, and finished similar to the ground floor apartments, may be stated at 440*l.* to 480*l.*, or from 110*l.* to 120*l.* for each tenement, contingent on the facilities for obtaining materials and the value of labour. Such dwellings, let at 3*s.* 6*d.* to 4*s.* a week, would, after deducting ground rent and taxes, afford a return of 7 per cent. on the amount of outlay. Where hollow bricks are obtainable at a fair price their use ought to effect a reduction of about 25 per cent. on the cost of the brickwork, or equal on these four houses to about 40*l.*"

* The [illegible] of it is so startling, that some facts or data of authority seem to be called for in [illegible] confirmation of it. In Liverpool and Manchester it is 33 in the [illegible] populations. In Cardiff and Merthyr Tydvil it is 30 in the thousand; in [illegible] it is 28 in the thousand; in Sunderland it is 25 in a thousand. On the other hand the average mortality of [illegible] more healthy registration [illegible] as given by Mr. Lee, one of the inspectors under the Board of Health, [illegible] in the thousand of the population; some, as Tavistock and [illegible], [illegible] 15 in the thousand. And as the general result of his observations ("[illegible] on Disease," 1851), Mr. Lee says: "I have shown [illegible] indisputable, that the inevitable mortality of the kingdom at large is not greater, but most probably less, than the proportion of 11 to a thousand [illegible]."

PHILOSOPHICAL INSTRUMENTS AND PREPARATIONS.

DOLLOND'S ATMOSPHERIC RECORDER.

MR. DOLLOND, the eminent optician, erected a small wooden house, in the enclosed area, outside the extreme western end of the building, to contain his highly-elaborated "Atmospheric recorder, or self-registering apparatus for the various changes of the barometer, thermometer, hygrometer, electrometer, pluviometer, and evaporator, and of the force and direction of the wind." This is the most complete and efficient instrument which has yet been contrived for this purpose. It consists of a rectangular frame, of about two feet by three feet six, firmly supported on four pillars. Near each end of the frame is a roller of one foot in circumference, to one of which is attached an eight-day clock, to drive it round once in twenty-four hours. The roller at the opposite end of the frame acts as a rest for carrying the register-paper to a platform in the middle of the frame. Near the end of the frame, which is placed towards the north, is a strong bar, upon which all the fulcra of the indicators, or markers, are placed; these markers, being arms of a foot long, with spring points at their ends, for the barometer, thermometer, and hygrometer, are struck down to the paper every half hour by a falling lever. For the electrometer, rain evaporator, and force and direction of the wind, ever-pointed pencils are used, making a continuous mark upon the paper. Each indicator has its proper scale set near the line of the registering points and pencils, so that the last marks may be compared with their respective scales, with reference to the time at which the indication took place.

On each side of the frame is a marker for time, governed by a wheel attached to the clock roller, which, by a lever and inclined planes, are made to register the time correctly at each half hour, and the sixth hour more strongly, for convenience in counting.

The barometer is on the principle of a syphon of large bore. Upon the surface of the mercury in the shortest leg, is placed an accurately counterpoised float, communicating by a thread and pully with the marker, the indications being given on a scale of three to one.

The thermometrical arrangement consists of ten mercurial thermometers of peculiar form, placed on an elevated stage, and having a corresponding indicator. They are suspended on an extremely delicate balance, the motion of which, due to the variations in the expansion of the mercury, is communicated to the indicator; they are screened from the wind by perforated zinc plates.

The hygrometer indicator is acted on by a slip of mahogany, cut across the grain, and placed outside the observatory, in a tube open at both ends. This slip of wood was prepared by placing it in a cylinder of water, suspended from its upper end, with a weight attached below, until it was found, by repeated examinations, that it was completely saturated, its length being increased to its full extension. This length was then referred to an accurate scale, the wood being placed near a stove pipe with the same weight hung to it, until it contracted to its utmost amount. The difference between these two results being then taken, the scale was formed accordingly. It is suspended and weighted, with full power to act on the indicator, quite free from the action of the sun and rain, and shows, upon an open scale, every hundredth of its extremes of dryness and moisture. This plan of hygrometer is the invention of H. Lawson, Esq., F.R.S., who has one in his possession, made for and used by Franklin, and which is still an accurate indicator.

The arm of the electrometer for thunder-storms and electric changes is worked by a well-insulated conductor, placed in an elevated position, and having a wire brought down to an insulator on the top of the observatory, and thence to a standard, through another insulator, to a metal disc; between which and a spring there is a moveable disc, attached to a glass arm. In connexion with this arm and disc there is a pencil, carried forward to the line of indication. The spring is fixed to a standard, at about three inches from the first disc; to this a wire is attached, and carried into the earth. When a cloud, charged with the electric fluid, comes within the range of the conductor, the moveable discs begin to pass slowly from the first disc to the spring, discharging, each time, a portion of the electricity, and increasing in rapidity of motion, until the discharge of the cloud by lightning takes place. It then falls back to the first disc, remaining still until again called into action in a similar manner.

The pluviometer indicator is in connexion with a receiver, which has an area of one square foot, and is elevated clear of anything that might interfere with the fall of the rain. From this external receiver, a pipe conducts the water to a cylindrical vessel beneath the apparatus. A float in this cylinder is in connexion with a series of inclines, contrived so that each shall represent an inch of rain. As the rain falls, the inclines pass upwards with the float, acting on the end of the indicator, which is thus moved over the required distance on the paper, showing as it proceeds, the result of each drop to the hundredth of an inch in superficies, until an inch is registered. It is then discharged, and returns to the zero of the scale for another inch.

The evaporator indicator is actuated in connexion with a square foot receiver, supplied with water from a larger vessel, being connected by a pipe beneath. From this connexion the movement is conveyed to the indicator, from a float in the larger vessel. The evaporator is covered with a plate of glass, set at an angle to keep out the rain, and yet allow of free evaporation.

The anemometrical indications are taken from a vertical board of one foot area, kept in opposition to the exact direction of the wind by a surmounting vane. This portion of the apparatus is nicely balanced to avoid all friction, and is in connexion with a chain passing over a pulley with weights suspended to it. The chain passes down the tubular vane shaft, near the foot of which it is attached to a set of inclines acting upon an indicator. When the board is acted upon by the wind, its motion elevates the weights, and moves the pencil on the scale, registering the weight lifted, in ounces and pounds avoirdupois. A little pencil, at the same time, indicates the direction of the wind by the turning of the vane. The paper for the registration diagrams is specially made for the purpose, so that a difficulty long felt by meteorologists in securing a suitable kind, is now removed.

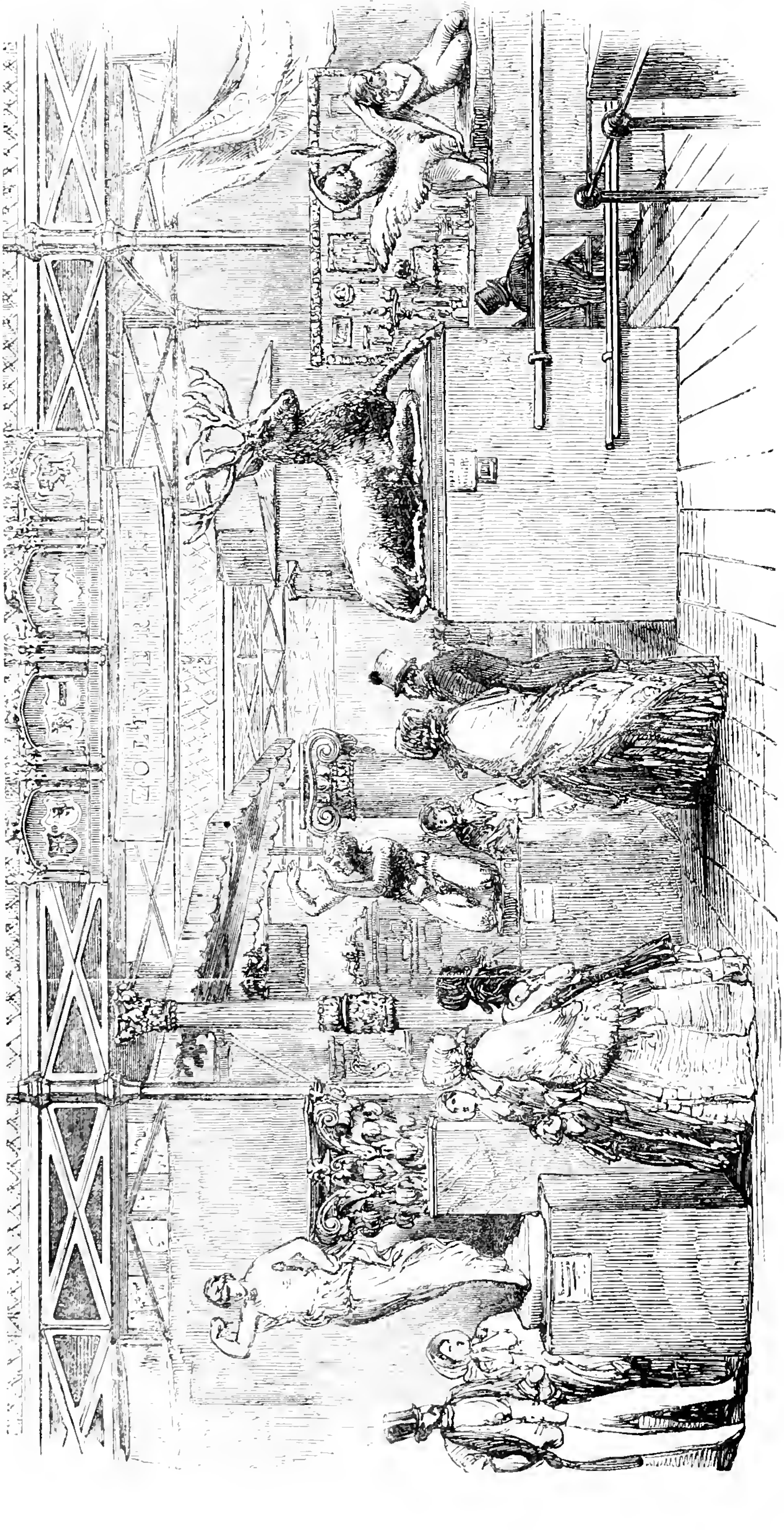
CONSTABLE'S COMPENSATING FLY-WHEEL.

IN the collection of mechanical models, we observed a curious one by Mr. W. Constable, being what he calls a "compensating fly-wheel." It is intended to perfect the action of the ordinary fly-wheel in its office of accumulating the irregular impulses of the reciprocating engine, and turning them into a uniform power. The common fly-wheel is, indeed, usually described as effecting this, pretty nearly to perfection, from its aptness in gathering up all contributions of power in virtue of its inertia; but it is plain that as it is fixed unyieldingly upon its shaft, whatever irregularities occur, whether from variations in the steam pressure, or in the resistance of the driven machinery, they must be communicated, to a greater or less extent, through the wheel to the machinery. Every one knows how palpable this is with a light wheel, as being more easily affected by the disturbing impulses: the remedy has therefore been sought, with but partial success, in increased weight.

As no increase in weight can fully correct these inequalities of motion, Mr. Constable has given us, in his model, a hint of another system. Instead of keying his wheel firm on the shaft, he places it loose, and, connects it to the moving power through the medium of springs. Alongside the wheel is placed a boss, with three radiating arms, extending nearly to the periphery of the wheel. This boss is keyed on the driving shaft, and to the end of each arm is attached a strap of leather, passing over a pulley set on a stud in the rim of the wheel. The stud passes through the rim, and its opposite end carries a second pulley, to the periphery of which a strap is fastened and passed from it to the outer end of a helical spring carried on the side of the fly-wheel arm. It is then clear, that if the moving force becomes accelerated, the three arms fast on the shaft will act in virtue of such acceleration upon the fly-wheel springs. These springs will absorb the surplus power, or, in other terms, the surplus velocity, so as to prevent the acceleration from acting at once on the wheel to urge it beyond its speed; whilst, on the contrary, when the moving force becomes weaker, or the arms fail in speed, the reaction of the springs gives out the surplus power formerly stored up in them, and the original relation between the impelling arms and fly-wheel is again resumed. In this way all oscillations of force will be conveyed through the springs, without in any way interfering with the fly-wheel.

But there is yet something more to be done. If both the strap pulleys are of the same diameter, the conversion of a fluctuating into a constant force would still be imperfect. One of the pulleys has its periphery formed to what the inventor terms the *isodynamic curve*, so that the lever of resistance within it, through which the impelling arm acts by the strap, increases as the impelling force increases. We are not aware that this scheme has yet received any practical trial; but as Mr. Constable professes not merely to improve, but to perfect the action of the reciprocating engine, we presume it will shortly be heard of amongst practical engine builders.—*Practical Mechanic's Journal.*

ENGLISH AND FRENCH FILES.—An interesting instance of the superiority of English over foreign files, was recently given at the Cutlers' Hall, Sheffield, on the occasion of the entertainment given to the Local Commissioners of the town. The narrator, Mr. Overend, himself a commissioner, stated that there was a French gentleman among the jurors, who very properly showed great zeal in protecting the interests of his countrymen. He had admitted that Sheffield had made the best files, but he maintained that there was a house in France that could make better. He challenged Sheffield to the trial, and he selected the house with which he would make the trial, and it happened to be that of which the mayor (Mr. Turton) is the head. He sent to France to have files made for the purpose. He brought over a French engineer to use them, and he challenged Messrs. Turton and Sons to the contest. Two pieces of steel were selected upon which to try the files, and they were fixed in two vices. Messrs. Turton accepted the challenge, but they did not send to Sheffield to have any files made specially for the occasion. They merely went to a London customer whom they supplied with files, and took files indiscriminately from his stock. They chose a man from among the Sappers and Miners in the Exhibition, to use their files against the French engineer and the French files made for the trial. The two pieces of steel being fixed in the vices, the men began to work upon them simultaneously. The Englishman with Messrs. Turton's file had filed the steel down to the vice, before the French engineer had got one third through. When the files were examined, Messrs. Turton's file was found to be as good as ever, while the French file was nearly worn out. The French juror then said, no doubt he was beaten in that trial, but Messrs. Turton's file must have been made to cut steel alone, whereas the French file was better adapted for iron. A new trial then took place upon iron, and the result was still more in favour of the English file.



THE ZOLLVEREIN DEPARTMENT.

FOREIGN AND COLONIAL DEPARTMENTS.

THE ZOLLVEREIN.

OUR readers are probably aware that the Zollverein—a name which occupied a large portion of the Foreign side of the Crystal Palace—is not that of any individual country. On the contrary, it designates a union of several States of Germany under one common custom-house law;—a policy, not a country,—which brings under one series of fiscal regulations, concerning import and export duties, the subjects of several States of Germany, having in other respects different laws and lying widely apart. It embraces Prussia, Saxony, Wirtemberg, Bavaria, Baden, Nassau, the two Hesses, and all the minor States of the centre of Germany, and comprehends altogether somewhere about 26,000,000 people. Hanover, Brunswick, Oldenburgh, Bremen, Lubeck, Mecklenburgh, on the north; Bohemia, Austria Proper and other German dominions of Austria, on the south, are not members of this union. Prior to its being formed, the 37 States, large and small, into which Germany was divided, levied each its own duties and tolls on rivers and roads, and had its own custom-house officers to levy them. As the rule, no goods could be transmitted through any one of these States to another, or sent from one to another, without being subject to all the vexatious delay of a custom-house examination at the boundaries of every State. The actual facts were still worse, for many noblemen and cities levied, till a very recent period, private tolls; and at their "bars" all goods were liable to a similar examination. The annoyance of this system, to say nothing of the accompanying annoyance of passports, which still continues, was immense, and far exceeded anything of which our people, long united under one Government, and having amongst themselves internally a perfectly free communication, have ever practically had to form any conception of. To get rid of some of these vexations, the States above mentioned, under the influence of Prussia, united themselves commercially about twenty years ago into one body, abolishing all intermediate tolls and customs duties, and levying only duties common to all, at the one extreme boundary of the confederating States, and dividing the revenue accruing among the different States composing the union, in proportion to their size, population, consumption, previous revenue, &c. All States not comprised in the Union, and preserving their own revenue laws, are, so far as trade and customs duties are concerned, considered foreigners. The reader will see, therefore, that the name Zollverein in the Exhibition is a mere political designation for a great part of Germany, separating it from Northern Germany on the one hand, and from the Austrian dominions on the other; and such products of the industry of the 26,000,000 people comprised in this Customs Union as they pleased to exhibit, it is now our intention to describe.

The department of the Zollverein was in the eastern part of the Crystal Palace, approximating towards the centre. It extended on both sides of the Nave into the galleries, as well as on the ground-floor; having Russia on the east and Austria on the west. Intermingled with it, however, was the space appropriated to Northern Germany, an arrangement justified by the

geographical relations of the two, but at variance with the political designations, and which became the cause of some confusion. In truth, disorder in arrangement, singularly enough for the methodical Germans, seems to us to have characterised their part of the Exhibition. Although Wirtemberg, Saxony, and Bavaria had distinct exhibition rooms on the south side of the Nave, in which to display their cloths and shawls and stockings; in the Grand Centre Hall of the Zollverein on the north some of their most distinguished products, and the most distinguished products of the other States, were mingled with the products of Prussia, which disabled us from forming a just appreciation of the industry of the separate people, or of the whole Zollverein. In the medley, we cannot compare and contrast what has been done by the lively, vain, egotistical and royal Prussian with the productions of the more solid and somewhat duller Hessian; nor can we conveniently distinguish between the industry which is rooted on the Iser, and that which flourishes on the Elbe or the Rhine.

For the above reasons the general remarks which follow will apply in a great measure to the industry of all the Germans, not excluding even the Austrians, though we shall describe separately the Austrian part of the Exhibition; and we must, therefore, make our readers fully aware of the number of people to whom they apply. The Zollverein comprises about 26,000,000; Northern Germany, about 4,000,000; and Austrian Germany, about 7,000,000. The tracts of land inhabited by these people extend from the Baltic to the Iser and the Rhine, from the German Ocean to the Carpathian Alps, and embraces a great variety of soil-surface and climate. It is rich in minerals and raw products, and is traversed by numerous large rivers. It is the best and principal part of central Europe. For such a country and such a people, the exhibition of their industry struck us as comparatively poor and comparatively uniform. There was a sameness in it throughout, not met with in any other part of the Exhibition, of equal pretensions.

In one great natural quality Germany is deficient, and the want of it has been much aggravated, instead of being relieved, by the policy of its governments. It has comparatively a small extent of sea-coast. Denmark and Holland shut it out from a direct connexion and communication with two parts of the ocean. It has had, therefore, in relation to other states, a small and not fast-growing foreign trade. The many small states into which it was divided, and the absurd fiscal regulations in each, added to the want of ocean communication, till very modern times, limited and hampered its internal traffic. The consequence was, that the subjects of each state were pretty much confined to their own products for subsistence; and comparatively little separation of employments, or little division of labour ensued, and, as a consequence, little variety in the industry of the people. The Germans rather pride themselves on the circumstance, that division of labour is not extensive amongst them—that they are what they call many-handed—but that is only an approach to barbarism, when every individual provided by his own means for all his wants. To satisfy the common demands for food and clothing they all necessarily adopted the same or similar arts; and the same causes continuing to prevent the separation of employments, they have continued the same or similar practices. In conjunction with this, too, the respective governments undertook to a degree unknown in England to guide the industry of their subjects; and as they were generally actuated by a similar policy, and had similar objects to attain, they generally directed the industry of the people in similar paths.

After the wants of food and clothing were supplied, the great object of the different governments, besides the common desire of military power, was to have luxuries provided for courts, which for a long period borrowed their ideas of luxury from the French court as a common model. Accordingly, as you pass amidst apartments hung full of cloth and of damasked linen, with a profusion of swords and cutlery, walking-sticks, pipes, buttons, and common tools, models of old castles or modern residences, with some fine porcelain, some exquisitely carved ivory, some delicate bronzes, and some admirably stained glass, you find a great uniformity in the products of numerous distinct and different people, for which you were hardly prepared; nor is the im-

THE NYMPH OF LURLEIBERG.—ENGELHARD.

GOBLET. CONRAD KNOLL.

DRINKING-CUP.—JOHANN HALLIG.

pression removed by the appearance of some well prepared leather for different purposes, some valuable mineral and other raw products, several specimens of wool, and some splendid crystals and colours; the result of chemical arts, and a little well-wrought furniture. What is called Berlin-wool, raised carpeting scarcely fit to walk on, models of castles, dried fruits, a multitude of ornaments in cast iron, an abundance of toys, playing cards, much ordinary jewellery, piles of stockings and suspenders, with a few printed books, complete the miscellaneous assortment.

Many of the articles would excite surprise in any exhibition, but we are chiefly astonished to find them so many leagues away from the place where they were made. The Germans supposed they were to sell, as well as exhibit: they looked on the Exhibition as a market, and thought that the cheapness of their hose, their cutlery, their common tools, and their cloth, would ensure them numerous customers. In fact, many of their articles have been exhibited avowedly only on account of their cheapness, not on account of their excellence, their rarity, or their beauty; and the exhibitors prepared and published a catalogue in which the prices are marked, for the very purpose of showing that they can undersell the English, particularly in hose, cutlery, and cloth. Till the quality of the articles can be brought to a test, this appears to be possible. They imitate our patterns, and try to sell their goods as English. We noticed—and to our surprise, in the Saxon department, and amongst the hose—one or two pair marked very distinctly, in good English letters, "Merino patent," an inscription which used to be stamped on a favourite English production. We have some doubts of the propriety of allowing such *contrefaçons* to appear in the Exhibition. They reminded us of what we saw on the Hartz mountains a great many years ago, where the shot cast at a celebrated lead manufactory were all packed up in bags, with the names and labels of English makers imprinted on them. We were told by an American gentleman in the Exhibition, "It is quite true the Germans have improved very much in making cutlery within a few years. I have had a great deal to do with them in the matter. They were anxious to sell their goods in our markets; but they were so clumsy, our people would not look at them. I then sent patterns of your best London and Sheffield makers to Solingen, and the Germans made their cutlery after these patterns, putting on them the name of Rodgers and Son, or some other celebrated English maker. The German cutlery looked very well, and was sold cheap, but, on being tried, it proved to be not half so good as that of the English, and I doubt whether the sale will increase." In various kinds of cutlery, that can scarcely be proved, the Germans make a great show; but it is evident even here, that the bulk of their articles are made after English patterns. The display was intended, too, we believe, more for foreign markets, than for consumption here.

If the Exhibition were a mart, where the artisan could buy a pair of pincers, a dandy a cravat, a housewife a jar of preserves or of potted larks, and parents Christmas presents for their children, it could scarcely have been richer in the supply of these and similar articles from Germany. With some exceptions, which it will be our business hereafter especially to notice, the products of German industry, taken as a whole, therefore, may be characterised as displaying little variety; and many parts of it were trivial, neither adding to national wealth nor helping forward national greatness. Admitting the fact, but implying that the Germans have a richer and more varied industry than they have shown, which we doubt, a German writer in the *Allgemeine Zeitung* states "that Germany is here exhibited to foreigners as small change." Who, then, is culpable for having kept back the large coins and the more precious ingots, if they exist?

German industry is not only uniform; it is obviously imitative. There is as complete a want of independent thought in their art as in their political reforms.

France had its *bijouterie*, its exquisite ornaments, its unmistakeable graceful luxuries, its adornments for boudoirs and persons; England had its solid and compact machinery, often as neat and elegant in form, though rigid, as it was useful; the United States had their rocking and their other chairs, their sewing machine, and their almost infinite application of caoutchouc: Russia had its furs, its hemp, its malachite; even Austria, with its Vienna furniture and its Bohemian glass, which are German, had something of its own. Nay, Tunis and India shone out conspicuous and peculiar. Only Germany, of all the nations of Europe, had nothing apparently in the Exhibition which could be said to be characteristic of it, but its toys, a few skull caps, and some useful specimens of domestic wool manufacture. Borrowing its ornamental arts mainly from France, its useful arts from England, the things it exhibited are chiefly imitations, very often deficient in the grace, the lightness, the neatness, and convenience of the originals. Its productions are solid, substantial, sometimes cumbrous, and generally honestly made, but they are all in the main French or English, rather than peculiarly German. Perhaps those who have had the ordering of the matter have wished chiefly to exhibit the success of the Germans as rivalling other nations, and have rather brought forward European than German productions. They have exhibited no specimen of their durable but old fashioned furniture; of their *frachtwagen* with their loads packed and secured to resist the jolting of bad roads, like the cargoes of ships, which move not when tossed about by the waves; no specimen of their multifarious vegetable productions on which the bulk of the people live, or of the useful and comfortable garments that their domestic industry still provides for the great multitude, all of which are at once peculiar and picturesque: they are sometimes, too, convenient. Germany has many peculiarities, but they belong to a past age, and the Royal Commissioners, who have presided over the German part of the Exhibition, have not been desirous to exhibit them. "I cannot deny," says the writer already quoted, "that, in general the specimens of German industry in the Exhibition (the fine arts are not included) have no peculiar character, and give me the idea of its having been the intention to avoid exhibiting what is national. German industry appears in every department to lean on something foreign, or to be an imitation, and nowhere to stand on its own feet. At one place we see the hand of England, and at another that of France. I may be mistaken, but this is my very distinct impression." If we turn to the machinery exhibited, we shall find it of little importance; and the principal objects, such as the vacuum pan and the Jacquard loom, very imperfectly improved as compared with others in the building, are borrowed from England or France. The machinery exhibited, and generally too the tools and the cutlery, are imitations of those of England, and can have nothing to recommend them, if it be not their cheapness.

The nature of German industry in general is brought into a strong light by the varied industry of Hamburgh, and the taste displayed in the exhibition of the articles sent from that city. It has furnished no less than 123; while the rest of North Germany, the kingdom of Hanover, Lubeck, the two Mecklenburghs, have supplied only 35. They consist chiefly of useful and ornamental furniture, such as side-boards, sofas, chairs, &c., of a very superior description of clocks, musical instruments, specimens of oil-cake and refined sugar, charts, pianofortes saws, rocking-chairs, looking-glasses, bird-cages, and a large assortment of walking-sticks. Here, however, instead of being merely hung against the wall, they were displayed in a cheerful tasteful manner, so that the Hamburgh room had a light and elegant appearance, superior to that of the central room of the Zollverein, in which were heaped together all the best and richest of its contributions. On entering the apartment, the spectator was much struck by a representation of the sun sending his rays on all sides, placed against the opposite wall of the apartment. It was composed of walking-sticks, chiefly from the workshops of C. A. Meyer, who employs several hundred persons, and exports walking-sticks to all parts of the world. In Hamburgh, as in London, it is a considerable trade; and, being a source of wealth, is not inaptly typified by the sun. Herr Meyer, the founder of the house, is a good specimen of what trade does for men in Germany as well as in England. He arrived in the city from Thuringia, with no other wealth than his skill in carving wood: and, by care, frugality, and an opportunity of exerting his talents, he has created a large establishment, and become one of the princely merchants of the city. He is an individual example of the general opulence and general industry and skill of Hamburgh. It was, and yet is, practically and truly free—not merely nominally a free city; and the success of its industry as displayed in the Exhibition in comparison with the industry of the many long-enthralled states of Germany, does honour to its freedom.

As we have already adverted to the Sculpture, and intend including that from Germany, we do not extend our present remarks to the latter. German sculpture takes a high place in the Exhibition, but that art, though treated successfully by the Germans, we need scarcely remark, is not peculiarly German.

With these first and general impressions we now proceed to make a tour (from recollection) of the Zollverein department, commencing with that on the north side. Our attention is arrested at the entrance by an object which forcibly reminds us of the military character of the principal State of the Verein, and indeed of all the German States. Planted at the centre, as if to forbid entrance, or at least to allow it only on conditions, stands a remarkably well-mounted field-piece. The gun gives you an idea of solid and substantial work. At the same time it is highly polished; and the plain varnished carriage is a perfect model, on a small scale, like one of Maudslay's engines, of compactness and neatness combined with great strength. The workmanship has the finish of a jewel, concealing in the instrument the power of a demon. Beneath it are polished cuirasses and other instruments or emblems of war, destruction, and death. This is the shape in which an invention of a new process for the manufacture of one of the most useful things shown in the whole department, cast-steel, is exhibited. We admire Herr H. Krupp's skill, but should have thought better of him and better of Germany had it been displayed in rollers such as are employed with great success at Munich, for grinding corn, or surgical instruments, or something more appropriate to this peaceful age and to the Exhibition, than a model field-piece.

Close by it, however, inviting you to the confidence which the gun repels, hangs an altar-piece, in which are worked and emblazoned the words, "*Gott ist die Liebe; und wer in der Liebe bleibt, der bleibt in Gott, und Gott in ihm*" ("God is love; and who dwells in love, dwells in God, and God in him"). There is not much in the article to admire, but the sentiment is very expressive of the affectionate kindly character of the Germans. The care they take to provide amusement and employment, as well as instruction for their children, as exemplified in one of their chief manufactures, and which a rugged hard people would have neither patience to begin nor the kindliness to continue, is another illustration of the same characteristic. The more one traces their kindliness in their manners, the more it is to be regretted that a contrary principle presides over their affairs, as typified by the field-piece. The softness of their character seems to allow a long dominion to a harsh political system; and a little more rugged energy amongst them would keep better in check the violence against which they now only direct a few enigmatic sentences.

Passing through, with some indifference, rows of arms, perhaps the

spectator may have his attention momentarily arrested by the various specimens of crockery, earthenware, or china manufactured in the neighbourhood of Frankfort on the Oder. It is clear, solid, and generally of pleasing forms, approximating more to our stoneware than to anything else that we are acquainted with, but is superior to that in its clear and uniform glaze. For neatness and utility, it is scarcely surpassed in the whole collection. The porcelain, both of Saxony and Prussia, is, of course, much more splendid; some of that is very much to be admired, and seems to find numerous customers, for several of the articles of the Berlin manufacture were very soon marked "disposed of;" but the porcelain, with its admirable paintings, comes within the reach of a few, while the elegant and clean-looking *thonwaaren* is attainable by the many, and must contribute to the pleasures of all who use it. This ware is largely exported to countries with which England trades; and we are inclined, therefore, to suppose that it must be as cheap as our ordinary ware, and it is, generally speaking, more elegant, and appears less brittle. Combined with several other things which come from Frankfort on the Oder, it gives us a much higher idea than we before had formed of that city as a place of manufacture.

From the very circumstance that much of the cutlery, particularly that from Solingen, is made after English patterns, it appears very good, and much superior to that which was formerly, and is still very much in use in Germany. Some of the surgical instruments, too, are very good: indeed are said to be made better in Berlin than in any other part of the continent. Some of the common jewellery, the supply of which is large, is well set; but the bulk of it, as is to be expected from the quantity, is common, and rather tasteless.

Germany abounds in metals; all the zinc in use comes from there: but, with the exception of its being applied to roof a house, a model of which is exhibited, showing some very substantial workmanship, and for spouts, we noticed no other important application of this ductile, and now much used metal. Those who have visited Germany must be well aware that there are many uses to which it might be most advantageously applied, and would contribute more to the health and comfort of the Germans, and the neatness of their houses, than most of the poor articles they exhibit.

Passing to the west and north, opposite the room for the machinery of the Zollverein, we observe two specimens of massive safes for money and papers. One is remarkable for the ease with which its heavy doors are moved, and the other for the impossibility of opening it without receiving instructions from the maker, and both for their many conveniences. Four of them, we have seen it stated, have already been ordered from Germany, in consequence of their having been seen here.

The machine-room looks bare, and at least is quite spacious enough for the machinery the Zollverein chooses to place in it. We believe that Germany is richer in such contrivances than the Exhibition shows. We should pronounce it very backward, were we to judge solely of its specimens here. Cards for combing, made of imported materials, seem to us very inferior to those made in Manchester. Engines for coining, punching, and milling are good, but nothing extraordinary. The Jacquard loom and vacuum pan we have already mentioned.

Civilisation and the power of man are directly in proportion as he is enabled by skilful machinery to command the assistance of nature. As he makes the expansive power of steam, or the weight of the atmosphere, or the rushing of streams, work for him, he is strong and powerful. Machinery being generally private property, men cannot be constrained to display it when they fear that the secrets connected with it may be discovered; and hence the samples in the Zollverein are not specimens of the best machinery of Germany. If they were, we should form an unfavourable opinion of the past, and a very unfavourable augury for the future of that country.

Now coming back to the south, we enter the great centre room of the Zollverein, crammed full of the *bijoux* of German art; but we must reserve what we have specially to say of that and other parts of the exhibition of the Zollverein to another occasion.

ILLUSTRATIONS IN PAGE 85.

THE NYMPH OF LURLEIBERG. BY ENGELHARD.

ALL who have steamed up the Rhine know the precipice of Lurlei, and its famous echo, which is supposed to repeat sounds fifteen times. There is some legend attached to it, in which a nymph is concerned, though at the moment we do not recollect the particulars. M. Engelhard, of Hamburgh, amongst other contributions in the plastic art, presents us with an inspiration of this fanciful creation—a composition of some merit of design, and not deficient in grace.

GOBLET. BY CONRAD KNOLL, OF BAVARIA.

CONRAD Knoll's goblet, the model of which, in plaster of Paris, was exhibited in the Zollverein Hall, and which is intended to be cast in bronze, is covered with devices illustrative of "loving and living on the Rhine." Those who know what a German's enthusiasm is in behalf of his beautiful Rhine, will be able to estimate the spirit in which this little decorative work has been conceived, and the labour and care bestowed upon it.

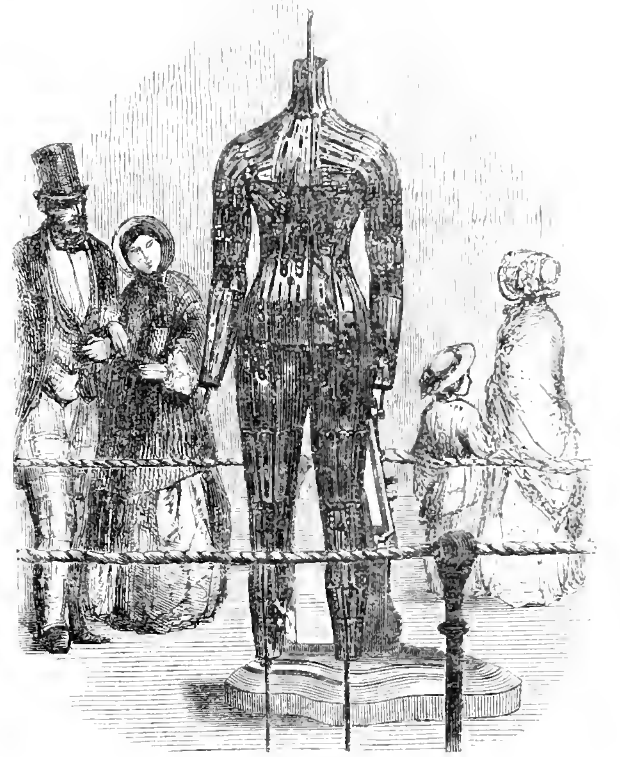
DRINKING-CUP. BY JOHANN HALBIG, OF BAVARIA.

HERE we have another tribute from German art to German nationality. This "Imperial German drinking-cup," or rather plaster model for one, is supposed to represent "the unity of Germany." On the top stands Germania in the Imperial States; the figures surrounding the cylinder are the allegories of the virtues [illegible] to unity. The [illegible] the Federal States, on the [illegible] that [illegible] on the cylinder those of the smaller German States. It [illegible] German thought and German aspiration, denied expression through "the ordinary channels of intelligence," as they call newspapers for shortness in the House of hereditary wisdom, had vent in allegory and plaster of Paris. In this light the cup before [illegible] a curiosity; as a work of art, it has small pretensions to admiration.

SMALL NOTABILIA OF THE GREAT EXHIBITION.

"PHILOSOPHY in Sport made Science in Earnest" was the title of a little book which we recollect reading with very great pleasure some years ago; and, published at a time when the generality of the community had hardly begun to inquire "in earnest" into the importance of natural and physical science, now every day producing such useful practical results, the modest duodecimo in question did good service by the awakening and inviting very many individuals to the pleasures and advantages of various branches of study, which they would otherwise never have dreamed of including within their province of intellectual observation.

But "Philosophy in Sport" is not always "Science in Earnest;" and industry unguided by the unerring truths of philosophy and the essential demands of utility, is sometimes nothing better than industry "run mad." Industry is one thing, and caprice is another and a very different thing: in like



DUNIN'S EXPANDING FIGURE OF A MAN.

manner, we may say that ingenuity is one thing, and whimsicality another: persevering good sense is one thing, and persevering folly a very different thing: so of workmanship and the production of a useful article, when compared with a prolonged waste of human labour in concocting and finishing a trifle, a toy, or an absurdity. These things all involve a different species of effort and result, and call for a very different sort of estimate. Amidst the innumerable examples of well applied labour in the Great Exhibition, it must, nevertheless, be confessed that there were also a considerable number, amounting, indeed, to a motley variety of articles, in the construction of which we are bound to say that much thought, and yet more labour, have been grievously misapplied.

Foremost amongst these we must place Count Dunin's "Man of Steel." This is a piece of mechanism, in the figure of a man, which is constructed of seven thousand pieces of steel. Most of them appear to be either springs or slides, and they are so put together and arranged as to be capable of a

(*Continued on page 90.*)

CLOCK-CASE. DESIGNED BY J. BELL.

Mr. Bell has contributed more to ornamental manufacture, in the plastic line, than, perhaps, any other artist of the day; and the present is by no means the least happy of his productions, coming as it does within the scope of legitimate sculpturesque decoration of a work of utility. It is styled the "Hours Clock-Case," from the fact of the face being embellished with a bas-relief representing the twelve hours circling round the clock; which itself has an enamelled dial, "representing the sun, its centre a flying phœnix, which fable relates is born anew every 500 years." At the base are two figures respectively illustrative of repose at evening, and the wakening to labour in the morning. The apex is crowned with a figure of Psyche, or the soul, looking upward, emblematic of eternity. The whole is prettily conceived, and pleasingly designed; though it might perhaps be improved in subsequent copies by omitting the void interval between the figures and the clock face, which produces an effect of flatness which is not satisfactory. The connexion between "the hours" and the clock would also be more distinctly marked by this alteration: the figures might, in short, be represented as supporting it through space. Some modification would, in that case, be necessary in the clock-face itself, which, instead of representing the sun, should represent a clock-face *tout pure*. This work has been produced in electro-bronze, by Messrs. Elkington, the exhibitors, in their best style.

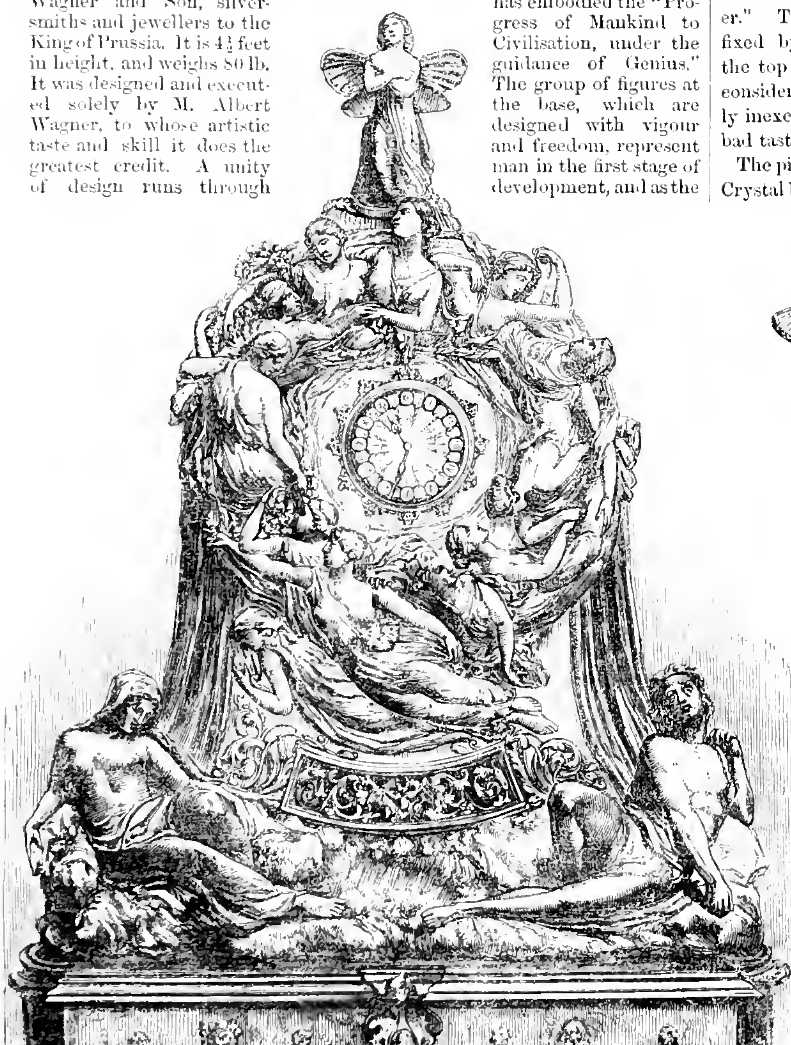
SILVER VASE. BY WAGNER, OF BERLIN.

One of the most interesting objects of art contributed by Berlin to the Exhibition of Industry is a magnificent silver épergne, from the establishment of Messrs. Johann Wagner and Son, silversmiths and jewellers to the King of Prussia. It is 4½ feet in height, and weighs 80 lb. It was designed and executed solely by M. Albert Wagner, to whose artistic taste and skill it does the greatest credit. A unity of design runs through the whole. The artist has embodied the "Progress of Mankind to Civilisation, under the guidance of Genius." The group of figures at the base, which are designed with vigour and freedom, represent man in the first stage of development, and as the hunter and herdsman. The female figures above denote the blessings of abundance attending the more regular pursuits of cultivation and husbandry. The bas-reliefs which encircle the outside of the vase have a reference to both these ages. Here closes the external struggle with nature. From within rises a palm-tree, surmounted by Genius bearing a torch, and strangling the evil principle of ignorance, typifying the internal culture of the soul to its perfectibility. The figures are sculptured, embossed, and cast, the workmanship of every part being of the finest description. M. Wagner has been awarded a prize medal for this elegant work.

ORNAMENTAL IRONWORK DOME. BY THE COALBROOKDALE COMPANY.

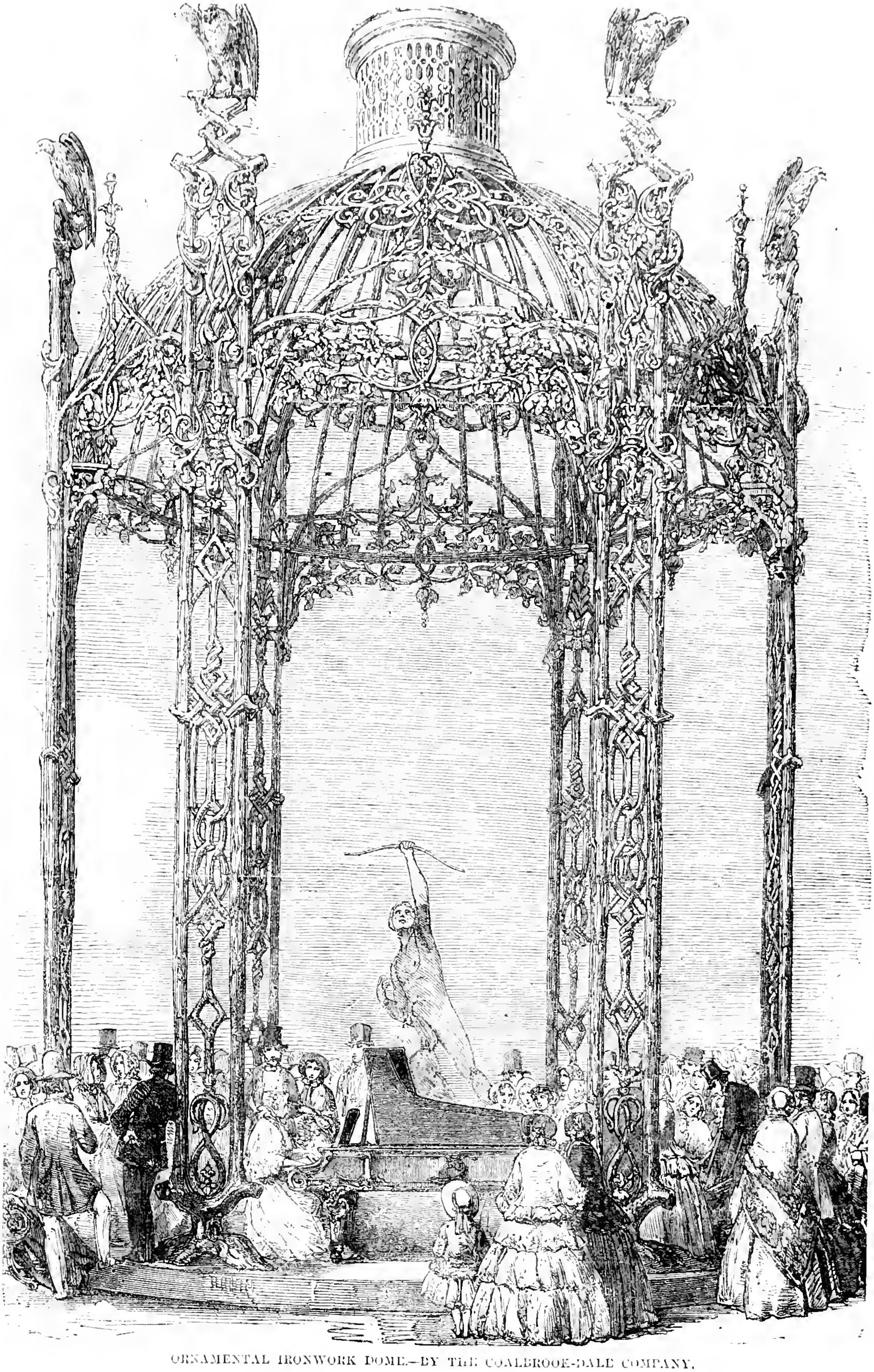
One of the most pretentious works in the Building was this fantastic and withal remarkably pretty inutility. The casting supports the reputation of the founders; but there are many and grave objections to the design, which is childish and purposeless. Though called a dome, it is merely a rustic garden house. The foolish-looking vane which crowned the whole we have omitted for want of space. Within is a cast of J. Bell's "Eagle Slayer." The eagle transfixed by an arrow at the top inside must be considered an absolutely inexcusable piece of bad taste.

The pianofortes in the Crystal Palace, more particularly the instruments placed in the Nave, were a never-failing attraction to loungers. On the more fashionable days crowds of aristocratic and attentive listeners were to be seen lingering around and within the cast-iron dome of the Coalbrookdale Company, listening to the tones of Collard's splendid grand pianoforte which here found a resting-place.



CLOCK-CASE.—DESIGNED BY J. BELL.—MANUFACTURED BY ELKINGTON.

SILVER VASE.—WAGNER, BERLIN.



ORNAMENTAL IRONWORK DOME.—BY THE COALBROOK-DALE COMPANY.

graduated movement, by means of which the proportions of the whole figure may be expanded from the standard size of the Apollo Belvidere to that of a Goliath. From these colossal proportions it may again be contracted at pleasure to any size between them and its original standard, as now displayed. The mechanism is composed of 875 framing pieces, 48 grooved steel plates, 163 wheels, 202 slides, 476 metal washers, 482 spiral springs, 704 sliding plates, 497 nuts, 8500 fixing and adjusting screws, with numerous steadying pins, so that the number of pieces is upwards of 7000. The only utility we have ever heard suggested as derivable from this elaborate piece of mechanism, is its applicability to the various measurements of army clothiers or tailors, as it would serve for the figures of men of various sizes. We do not know whether this is the purpose assigned to it by the inventor, as it seems a very absurd one; the same result being far more easily attainable by the incomparably more simple means of half a dozen dummies, or wooden lay-figures.

But hold! it behoves us to speak with deference and humility in this matter, seeing that the Council of Chairmen of Juries, the supreme heads of wisdom, to whom the dispensation of the Exhibition honours was intrusted, have thought proper to reward the constructor of this huge mechanical toy with a "Council Medal." Yes, hear it, Troughton and Simms, who talk about novelties in astronomical instruments to which a council medal was denied, though recommended by the jury; hear it, Claussen, whose newly-discovered, and nationally important processes in the preparation of flax received only a common medal; hear it, Losely, whose compensated pendulum, one of the most ingenious and valuable improvements in horology in the whole Exhibition—; hear it, Applegath, whose vertical printing machine—; hear it all ye whose performances have to share the common fate of merit in "a certain degree;"—the Jury in Class X ("that of philosophical instruments, and processes depending upon their use,") have awarded, and the Council of Chairmen have confirmed to Count E. Dunin a council medal:—"*For the extraordinary application of mechanism to his expanding figure of a man!*"

After reading this result, we began to be somewhat doubtful about all we set out with touching "Philosophy in Sport," and nice distinctions between "ingenuity" and "whimsicality" and so forth; and in a moment of bewilderment and irritation, were almost upon the point of consigning the notes upon which the rest of this article will be composed to the fire. But fortunately, we were restrained from so doing, by an urgent application for "copy" from a quarter which is not used to be denied, and therefore we proceed with the task upon which we set out.

Still in the Philosophical Instrument Department, we come upon "an apparatus of a peculiar construction, showing the ebb and flow of the tides," exhibited by a Mr. Ryles, of Cobridge, Staffordshire Potteries, who thus describes the novel theory it is intended to illustrate:—"The article I sent to the Exhibition, is an apparatus *to illustrate the idea of the earth, being a living creature encased in a shell*, as a snail-house or sea-shell, and by the action of the heart, causing the tide to ebb and flow! Press down the blower, and the heart (as seen through the glass that is on the top of the shell), will contract, causing the tide to rise; let the air out of the shell, and the heart will expand, causing the tide to fall." He adds, "I want a patron that would enable me to show how *the tide causes the rotatory motion of the earth*, which only poverty prevents my doing."

Mr. Ryles has *not* received a council medal, nor a prize medal, not even "honourable mention," which, considering the honours heaped upon the "expanding figure of a man," we consider hard. The least Count Dunin could do, would be to share his council medal with Ryles, and, thrusting the model of the "living creature" constituting the Earth, into his "extraordinary application of mechanism," exhibit its expansibility by revealing "the action of the heart" of the encased monster.

Dr. Gray, of Perth, has invented a medical walking-staff, containing instruments, medicines, and other professional articles. Would not a small tin case, or a sandwich box, have answered the same purpose far better, and far more conveniently, as it might be put into the pocket, where the "medicines," not being half so much "shaken" as in the walking-staff, would have less chance of fermentation or other injury!

An "artificial silver nose" has been invented by Mr. Whitehouse. We will not pronounce rashly upon this; but it strikes us, that, as all artificial noses, both in shape, size, and the amount of nose required, will depend upon the amount wanting by an individual, and the size and shape, in fact, suited to his particular case, the material also of which the nose was manufactured would very often have to be regulated by the special circumstances.

Art-manufactures in *mutton fat* are certainly a novelty, and Mr. W. E. Hall, of Bideford, exhibits "a socle, or kind of vase," made of a mixture of mutton fat and lard. We should fear that in a hot summer, or in a cold winter when a good fire is needed in the room, these articles would be extremely liable to a change of form not at all contemplated by the inventor; nay, there might be occasions on which they would "run away" altogether.

Mr. M'Clintock, of York, exhibits a chain in regular links, the whole of which, we are informed, has been cut out of a solid block of wood: to what purpose, except to the unnecessary length of time such a performance must occupy, we are totally at a loss to conceive. Mr. M'Clintock has, however, been surpassed by a lieutenant of the navy, whose name has escaped us, and which we do not know where to look for in the Catalogue, who has achieved the same result from a block of wood with the help of no other tool than a penknife. Will anybody endeavour to surpass them both, we wonder, by doing the same thing with a pin?

We do not very well know what to say about the "ostracide," the instrument with a grand name for opening oysters, and bearing a close resemblance to a pair of sugar-nippers. It may be useful, or it may cut the oysters to rags in the operation; we hope not; but Messrs. Brown, of Newcastle, will excuse us if we hint, that, to avoid this, it may be necessary to practise opening oysters with the ostracide almost as much as with the old-fashioned oyster-knife.

"The semibreve guitar" of Mr. Dobrowsky was a good thought enough for a new name, and for a fresh attempt to prolong the sound of the notes of the guitar; but, if the inventor would have us understand by the term "semibreve" that his instrument will sustain a note of any such duration, we must plead absolute scepticism to the possibility of any instrument of this kind being made to accomplish such a result.

The enharmonic guitar, manufactured by Panormo, of High-street, Bloomsbury, claims for its original inventor and designer no less a personage than the ingenious Colonel Perronet Thompson, M.P., who some years ago invented a new kind of organ. Of the enharmonic guitar now exhibited, it is announced that it is "capable of being arranged in the perfect ratios for upwards of twenty keys." We do not doubt this; we accept it at once, not only from what we know of the scientific capabilities of a guitar, but of the great scientific attainments of Colonel Thompson: but after his enharmonic guitar has been "arranged" for any of these keys, what will be the effect of "playing" in them, amidst all this mechanical interference with the finger-board! So much for the impediments to execution, to say nothing of tone. We must say, in justice to Mr. Panormo, the manufacturer, that, being convinced his own simple guitars on the Spanish model have more tone in them than any other guitars, we regret he should have employed so much labour in the construction of this very ingenious, learned, and impracticable invention.

Mr. Jones, of Lombard-street, exhibits "a silent alarum bedstead to *turn* any one *out of bed* at a given hour." This is certainly one of the most amusing inventions we ever heard of. It assumes a degree of density in the sleeper which no alarum can affect, or else a singular amount of luxurious weakness of purpose. The bed, therefore, acts the part of Resolution for the sleeper; and having been "set" over night for a given hour in the morning, the said incorrigible sleeper finds the bed revolve so as to tilt him out; and a bath being placed by the bed-side, he may at once be relieved of all need for summoning a resolution either to get up or to take a plunge.

The Chinese have long been famous for their caprices of invention, and whimsicalities of workmanship, over each article of which the greater portion of the lives of several artisans appear to have been expended. We find exhibited here some of their celebrated ivory balls, richly carved outside, and containing another, a size less, inside, richly carved also, with open-work, to show you, that there are balls within balls to the extent of twenty or more, each cut clear of the rest, and carved and capable of being turned round—the whole of these being produced by means of a variety of curious tools and instruments, out of the first solid ball. This, they assert, nobody else can do; and it may be true, for the Chinese are capable of wasting any amount of time upon any triviality. But the Chinese are not the only people who have a love for difficulties, for the sake of the unnecessary labour and time they involve, which gives the articles so much additional value in their eyes. If Quang Sing, of Canton, carves and engraves upon peach stones, and makes baskets and boxes with the stones of apricots and nectarines, Mr. Jacob, of Coventry-street, displays egg-shells with carvings and engravings upon them, and "views inside." If Shee-king, of Macao, delights in wasting his own life, and the lives of others whom he employs, in carving a nest of ivory balls out of one solid ball, instead of obtaining a similar result, (if the world *must* have these toys) by the regular tools and simple means of ivory workmanship, we find several of our own countrymen equally assiduous in substituting a common penknife in order to perform operations which proper tools would effect far more easily in a tenth, perhaps a hundredth part of the time. There seems, in fact, a sort of mania for this penknife-work. Mr. Aston, of Chelsea, executes a model of St. James's Church, South, in cardboard, with a penknife; Mr. Scollick, of Birmingham, exhibits a model of St. Paul's Cathedral; and Mr. Dickenson, of Waterloo-place, a model of York Minster, each in cardboard, and each employing no better instrument than a penknife. M. Schnitzer, of Jerusalem, exhibits two vases carved, out of a species of sandstone found in Jerusalem, with a penknife, which the proprietor, Sir Moses Montefiore, takes care to inform the world was "an ordinary penknife."

In like manner, we find an exhibitor who displays a model cottage composed of 2000 pieces of willow wood (these also are all carved with a penknife); and there was a table to be seen which is composed of 2,000,000 of separate morsels, all inlaid in mosaic-work. The practical philosophers and economists of modern times complain of the great waste of human labour in the construction of the Pyramids of Egypt—let them consider the same subject in reference to this table.

Many of our readers were doubtless, like ourselves, much struck with

the model of a ship, made with bottle corks, and rigged in the same fashion. The object of this "caprice" we cannot fathom.

Mr. Cossens, of Holborn, exhibited a model made in elder pith; and Mr. Clifford, of Exeter, displayed models made "of the pith of the common green rush," which he carefully informs us is such as is "used in making rushlights."

In one of Hogarth's prints there is a capital satire upon the expenditure of extraordinary means to produce a simple result. You see a pile of complicated machinery, which indicates that an operation requiring great power is about to be displayed. The skill of the artist in the design and in the arrangement of light and shade causes the eye to travel about and examine the various parts of the machinery in order to ascertain the work it is about to perform, when finally you discover at the bottom of the great machine an ordinary wine bottle, the neck of which is corked, and the whole of this machinery is evidently employed in "drawing the cork." Of a similar kind of elaboration in order to effect a very simple object, we fear we must class some of the new inventions in horns and flutes, to the former of which many complicated crooks and curves, and to the latter many scarcely practicable keys have been added, merely to enable the instrument to produce a certain note which might be omitted with no great loss, or produced by other means. Nothing injures tone more than a superabundance of mechanism. Vivier always plays on the old French horn, without any of the complicated improvements, and Nicholson used to play on a flute much simpler than many now exhibited, and we have never heard any performer who gave so much tone to the instrument.

An American inventor of the name of Wood, exhibited a combination of the pianoforte and violin, with which he assumes that pieces can be played with the effect of these two instruments in concert. Something like this, no doubt, may be accomplished by giving an attachment to the piano, which shall produce a resemblance to the sound of a violin; but in the present instance the inventor has literally attached a violin, played upon by four bows, which are put in motion by a separate set of keys on a small upper finger-board, which cause the bows to "saw" (as we may truly say) upwards and downwards, with an effect which we frankly confess to be indescribable. You can see the whole operation; and a more ludicrous thing both to see and hear, it has seldom been our lot to experience. Moreover, there is nothing new in the contrivance. The "Philosophical" Jury, Class Xa, however, discovered some peculiar merit in it, and have awarded the maker "50*l.* for the expenses incurred in constructing his piano-violin;" a slice of "solid pudding," (as ***Punch*** describes his imaginary award of 20,000*l.* to Sir Joseph Paxton,) far more acceptable than medal or "honourable mention."

An inventor exhibited "a model of a carriage," which supplies its own railway, laying it down as it advances, and taking it up after the wheels have passed over. This is extremly ingenious; but, unfortunately, it *supposes* the existence of a level line for the operation, so that its utility becomes rather questionable.

A drinking glass was exhibited, with a partition for soda and acid, to be mixed separately, the junction of the two streams effecting effervescence only at the moment of entering the mouth. Few people could "stand this" we should think.

In the windows of most of the great cutlers of London may be seen knives with an extraordinary number of blades; and on the ground floor of the Grand Exposition was exhibited a large glass case, as big as a handsome summer-house, full of all sorts of fine cutlery and other workmanship in steel, the most prominent features of which are several of these preposterous knives. Some seem to have 50 blades, of all sorts of shapes and sizes, others 150 blades, and one or two of them, we feel assured, cannot display less than 400 or 500 blades. To accomplish this capricious feat, the inventors are always obliged to have recourse to a strangely thick handle of an utterly impracticable kind as to all handling: and in the glass case referred to might be found one in the shape of a cross, thus combining four handles, each one crowded with blades: another has the handle in the shape of a star or double cross, thus combining six handles, each one bristling with blades, and arranged at the end of each handle in the form of a fan of bright penknives and blades of instruments. But all these are surpassed in capricious ingenuity by a "knife," the handle of which, if we must call it so, is a combination of three handles, each in form of a cross, the largest being in the middle. The three crosses are combined by an upright shaft, and each of the three comprises four handles. Thus, we have twelve handles in one, and from each of the twelve there sticks out a shining fan-work of blades and steel instruments, of all conceivable shapes, and all real or imaginary offices, not one of which could be put in operation amidst such a crowd. It is one of the most wonderfully useless things we ever saw. As to the number of blades and tools, they defy calculation. In the same case might be seen miniature knives, which are actually of the same kind, and present numerous blades from a handle of an inch and a half in length. Also miniature knives and scissors of an inch long, of half an inch long, and of a quarter of an inch long; and, by way of completing the wonder, twelve pairs of miniature scissors, placed in little brass scales, which show that the whole twelve only weigh half a grain. They require a microscope to be seen properly, when it becomes manifest that they are perfectly formed scissors. We suppose Messrs. Rodgers would say, in explanation of all this fancy-work, that the *use* of it was to show the world what Sheffield could do, not only in work, but in play.

GLASS MANUFACTURES.

II. Various Kinds of Glass Described. Glass Cutting and Colouring.

In our first article on the subject of Glass Manufactures, (No. 4, pp. 49–51), after giving a history of that useful and beautiful production, we confined our observations to a description of the process adopted by Messrs. Chance and Co., in manufacturing the glass used in the construction of the Crystal Palace—a process by which plate-glass was made by blowing and pressing, somewhat after the fashion of broad glass. This, it will be observed, is a new method of procedure as relates to plate glass, and it is one which could not have been adopted if the heavy duties upon glass, which existed till within the last six years, had still been retained. The reason of this is well known to all acquainted with the various processes employed in this manufacture, all of which were conducted under the *surveillance* of the exciseman. By the rigorous rule adopted by this tax-master, all material once put in course of manufacture was held liable to duty, even though broken, or wasted by accidental causes. The consequence was, that experiments were out of the question, and all thoughts of attempting new or improved principles abandoned.

Having explained thus much, we will now retrace our steps a little, and describe the various sorts of glass, and the processes ordinarily applied to them, previous to the removal of the glass duties. We will afterwards take a review of some important new processes of recent adoption which we find exemplified amongst the contributions to the Great Exhibition.

Generally speaking, there are three kinds of glass in ordinary use:—Flint glass, Plate-glass, and Crown-glass; but some make five sorts, viz.:—*Flint-glass, or Crystal; Plate-glass; Crown-glass, or German sheet-glass; Broad glass, or common Window-glass; and Bottle-glass.*

Flint-glass, the most fusible of any, is used for bottles, utensils intended to be cut and polished, and for various ornamental purposes. The best kind is composed of white silicious sand, pearlash, red oxide of lead, nitrate of potash, and the black oxide of manganese. It fuses at a lower temperature than crown-glass, and has a beautiful transparency, a great refractive power, and a comparative softness, which enables it to be cut and polished with ease. On this account it is much used for glass vessels of every description, and especially those which are intended to be ornamented by cutting. It is also employed for lenses and other optical glasses. Flint glass is worked by blowing, moulding, pressing, and grinding. Articles of complex form, such as lamps and wine glasses, are formed in pieces, which are afterwards joined by simple contact, while the glass is hot. It appears that the red lead used in the manufacture of flint-glass gives up a part of its oxygen, and passes to the state of a protoxide.

Plate-glass, so called from its being cast in plates or large sheets, is the most valuable, and is used for mirrors and the windows of carriages. It is composed of white sand, cleansed with purified pearlashes and borax. But, should the metal appear yellow, it is restored to its pellucid transparency by the addition (in equal proportions) of a small quantity of manganese and arsenic. It is cast on a large horizontal table, and all excrescences are pressed out by passing a large roller over the metal. To polish the glass, it is laid on a horizontal table of freestone, perfectly smooth; and then a smaller piece of glass, fastened to a plank of wood, is passed over the other till it has received its due degree of polish. But, to facilitate this process, water and sand are used, as in the polishing of marble; and, lastly, Tripoli, smalt, emery, and putty, to give it lustre.

It has been already explained that a sort of plate-glass is now made by blowing and pressing. It was so made for the Great Exhibition Building.

Crown-glass is the best sort of window glass, and differs from the flint-glass in containing no lead, nor any metallic oxide, except manganese, and sometimes oxide of cobalt in minute portions, not as flux, but for correcting the natural colour. This glass is much harder and harsher to the touch than the flint-glass; but, when well-made, it is a very beautiful article. It is compounded of sand, alkali, either potash or soda, the vegetable ashes that contain the alkali, and generally a small portion of lime. A small dose of arsenic is often added, to facilitate the fusion. Zaffre, or the oxide of cobalt, with ground flint, is often used to correct the dingy yellow of the inferior sort of crown-glass; and by adding the blue, natural to glass coloured with this oxide, to convert the whole into a soft light green. 1 ounce of zaffre is sufficient for 1000lb. But when the sand, alkali, and lime, are very fine, and no other ingredients are used, no zaffre, or corrective of bad colour is required. A very fine glass of this kind may be made by 200 parts of pretty good soda, 300 of fine sand, 33 of lime, and from 250 to 300 of the ground fragments of glass. We had formerly in London two kinds of crown-glass, distinguished by the places where they were wrought; viz.:—1, Ratcliff crown-glass, which is the best and clearest, and was first made at the Bear Garden, on the Bankside, Southwark, but since at Ratcliff: of this there are twenty-four tables to the case, the tables being of a circular form, about three feet six inches in diameter. 2, Lambeth crown-glass, which is of a darker colour than the former, and more inclining to green.

Crown-glass is made by blowing in the form of circular plates of 50 or 60 inches in diameter; this is effected in the following manner: a quantity of "the metal," in a pasty state, having been collected upon the end of

the blowing-tube, is converted by blowing into a globe of the requisite thickness. This globe is then transferred to the end of a rod, and after being re-heated, is twirled round and round,—just as a mop is twirled, in order to drive out the water: the effect of this twirling, by the centrifugal force generated, is to elongate the globe laterally: that is, to flatten it gradually from the shape of an orange down to that of a circular disk. The sheets may be seen in the circular form in the glass-cutting shops.

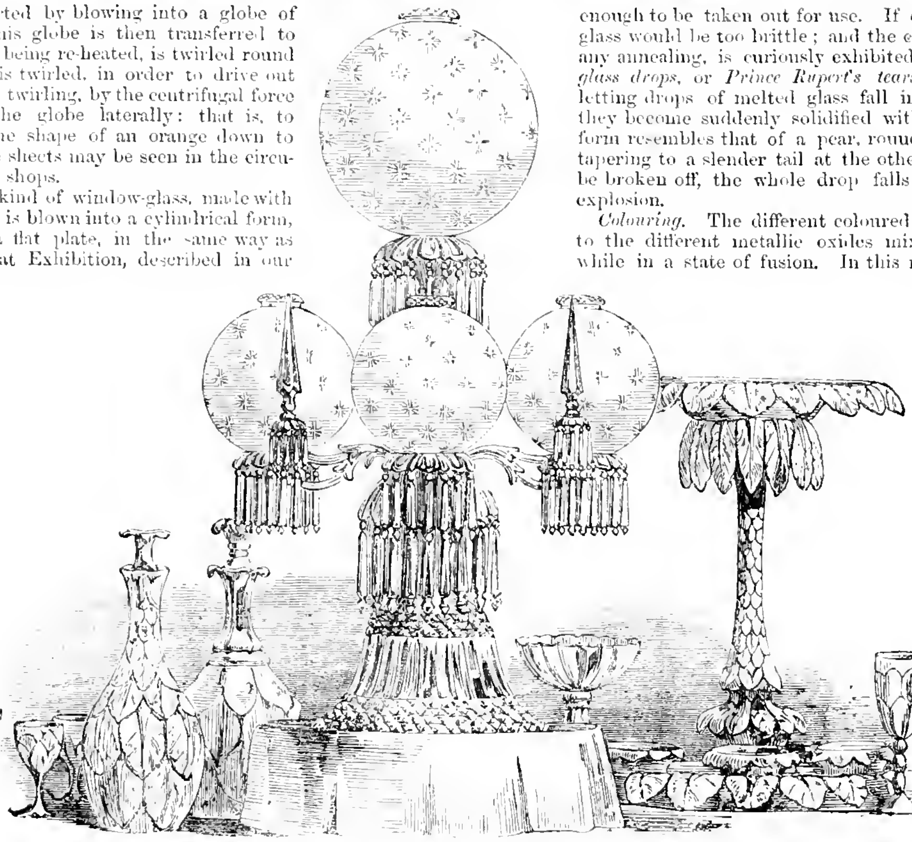
Broad glass is an inferior kind of window-glass, made with a cheaper kind of alkali. It is blown into a cylindrical form, cut open, and spread into a flat plate, in the same way as the plate-glass for the Great Exhibition, described in our previous notice.

The *bottle* or *green glass*, usually made of common sand, lime, and some clay, fused with an impure alkali, is very hard, and resists the corrosive action of all liquids much better than flint glass: the green colour is owing to the iron: and it is well adapted for chemical vessels.

We now come to speak of *Annealing*, which is a process which all glass requires to undergo before using. For this purpose large furnaces are prepared, where the glass, after being blown or cast, is deposited, first in a heat not sufficiently high to melt it, and it is then successively removed to cooler parts of the annealing chamber, till it becomes cold enough to be taken out for use. If cooled too suddenly the glass would be too brittle; and the effect of cooling without any annealing, is curiously exhibited in what are known as *glass drops*, or *Prince Rupert's tears*. These are made by letting drops of melted glass fall into cold water, whereby they become suddenly solidified without annealing. Their form resembles that of a pear, round at one extremity, and tapering to a slender tail at the other. If a part of the tail be broken off, the whole drop falls to pieces with a smart explosion.

Colouring. The different coloured glasses owe their tints to the different metallic oxides mixed with the materials while in a state of fusion. In this manner are made those excellent *pastes*, which so faithfully imitate, and not unfrequently excel, in brilliancy their originals, the gems of antiquity. The glass, however, for this purpose, is prepared in a peculiar manner, and requires great nicety. It combines purity and durability. *Opaque* glass is made by the addition of the oxide of tin, and produces that beautiful imitation of enamel which is so much admired. Dials for watches and clocks are thus made.

Glass-cutting is performed by



GROUP OF GLASS.—MESSRS. POWELL, VIZ., LARGE GLASS STAND, WITH FOUR GAS-BURNERS, DESSERT SERVICE, ETC.

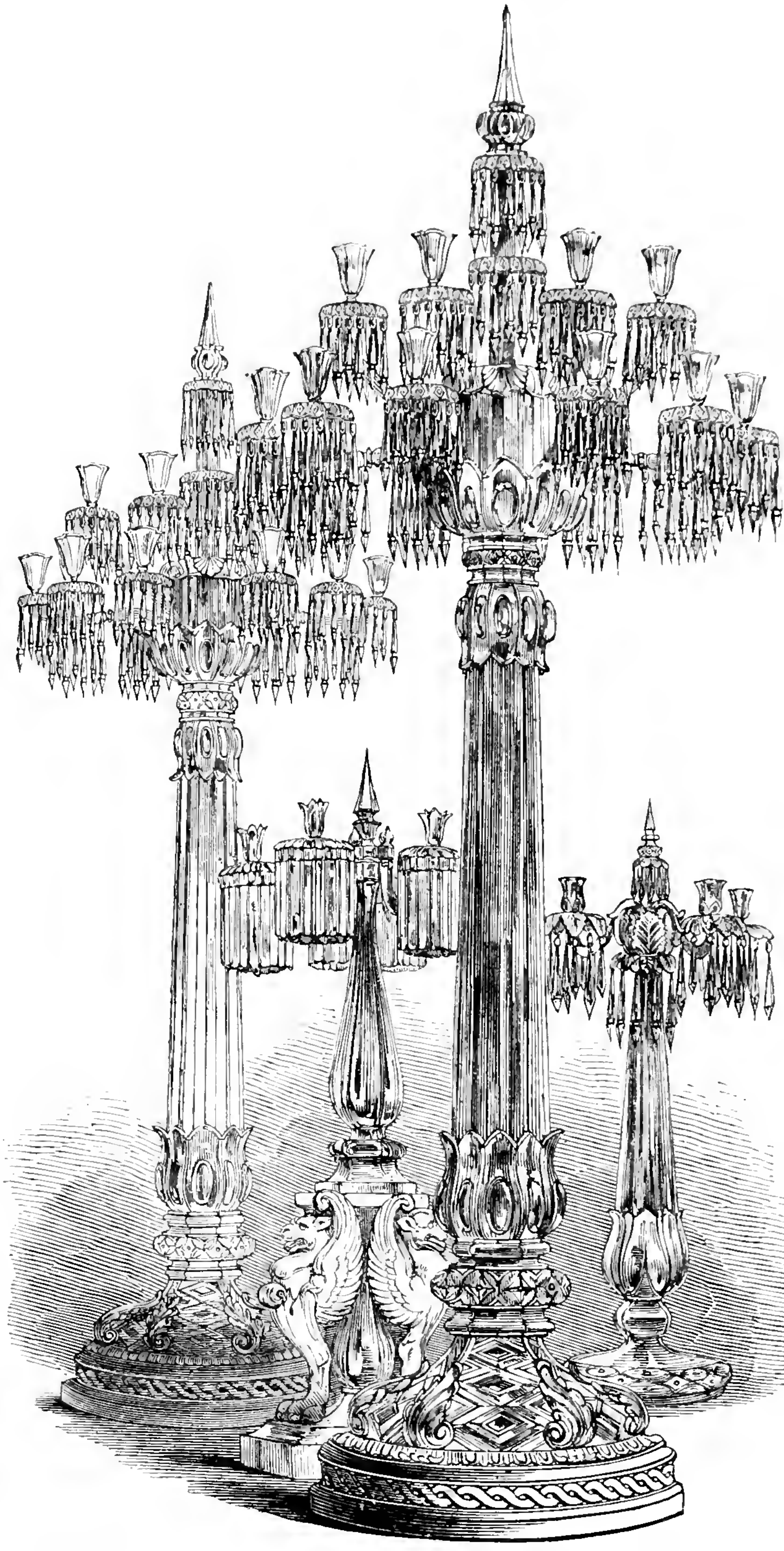
GROUP OF BOHEMIAN GLASS.

grinding the surface upon small wheels of stone, metal, or wood; the glass being held to the surface of the wheels, and moved about by the hand of the workman in the directions necessary to produce the desired figure. The first cutting is done with wheels of stone; the second with iron, covered with sharp sand and emery; and finally with brush wheels, covered with putty. The cut surfaces are polished in parts, or left dead according to the requirements of the design. A small stream of water is kept continually running on the glass to prevent the friction from exciting too much heat. In the case of very thin articles, as the finer description of wine-glasses, the material is supported by means of a wooden form or mould introduced into it; upon which also are sometimes marked the principal points of the design.

We now turn to a consideration of some of the remarkable evidences of our newly developed industrial energies, in this branch of manufacture, presented by the various collections exhibited in the Crystal Palace. Of the Palace itself, and the Crystal Fountain which adorned its central compartment, we have already spoken, in some detail; we have now to deal with other instances, individually less striking in their appeals to the eye, but to the full as interesting in an industrial and scientific point of view.

Messrs. Chance and Co. who supplied the glass for the Exhibition building, are also exhibitors of an article which until the removal of the duty (we shall never have done referring to that odious burthen!) was scarcely ever attempted in this country. One of the specimens of dioptric apparatus for lighthouses, in the western nave, was from their manufactory; the other was constructed by Mr. Wilkins, of Long-acre, for the Trinity Board. This optical apparatus is itself a distinguishing feature of our improvement in glass manufacture. Hitherto all the lenses of this order have been supplied from the Continent. The light-houses on our own shores could only be rendered effective by the use of French and German glass. Here we have, however, the most interesting proof that we can make these beautifully arranged lenses and catadioptric zones for ourselves. Fresnel claims the merit of this last improvement, by which a total reflection of all the light is effected; but at the same time it must not be forgotten that the experiments and suggestions of Sir David Brewster, during the investigation of the commissioners appointed to report on the northern light-houses were the starting point of the inductive process from which this final deduction was derived. Messrs. Apsley Pellatt and Co. are large exhibitors of flint glass. They commenced by showing all the materials employed in its manufacture, together with models of the glass-house furnaces — completing their series by examples of the purest crystal, particularly as employed for candelabra and chandeliers. The large chandelier which hung at the corner of the north central gallery and the transept, manufactured for Messrs. Perry, is a very beautiful example; it is constructed for 144 candles, and the prismatic drops are so cut and arranged that the general result is the appearance of one elegantly formed mass of crystal.

The exhibition of the candelabra made for her Majesty by Messrs. Osler, of Birmingham, and other examples of flint glass from the same firm — in addition to those already named, and to others whose works we shall eventually examine in detail — prove the perfection of this branch of manufacture. It is not merely in transparency to light and in freedom from colour that the beauty of flint glass or crystal consists — it is in the diamond-like property of sending back the rays to the eye in greater brilliancy than it receives them; and in this respect much of that which was shown in the Exhibition is very perfect. The English were not formerly successful in giving



CRYSTAL CANDELABRA—OSLER.

THESE SPLENDID CANDELABRA, IN CUT CRYSTAL, WERE MANUFACTURED FOR HER MAJESTY. THEY STAND EIGHT FEET HIGH, AND HAVE BRANCHES FOR FIFTEEN LIGHTS EACH. IN THE SAME GROUP ARE SMALLER CANDELABRA.

colour to their glass; there was always a want of that brightness which distinguished the works of the Germans, and particularly of the Bohemians. The colours are given in nearly all cases by metallic oxides, and these vary not merely in tint, but actually in colour, by the quantity of heat to which the fused mixture is exposed. In the Bohemian glass a ruby, in particular, was produced of far greater beauty than anything which our manufacturers could accomplish. This colour is due to oxide of gold, although reds of much brilliancy can be produced by copper, and also by iron. Some examples of the reds produced by these metals were found amongst the productions of British exhibitors; and upon examining the examples of Bohemian glass, it became apparent that we can now produce glass in every respect as brilliant and as intense in colour as that which has rendered our continental friends so long celebrated. In the articles exhibited by Mr. Varnish and Mr. Mellish these colours were well shown. Most of the glass exhibited by them was manufactured by Messrs. Powell and Co., Whitefriars, and this itself presents a noticeable peculiarity. All the glass is double, the object of this being to enable the patentees to fill the inside with a solution of nitrate of silver, to which grape sugar is added, when all the silver held in solution is deposited in a beautiful film of revived silver over every part of the glass. This *silvering* on the interior wall of the glass (globes, vases, and numerous other articles are shown to be susceptible of the process) has the property of reflecting back through the glass all the light which falls on the surface—whereas ordinarily some is transmitted, and only a small portion reflected. This exalts many of the colours in a striking manner, and not only does it exalt the colours, but the dichromism of the glass is curiously displayed. Much of the red and yellow glass thus assumes an opalescent tinge of blue, which, in some examples, is not unpleasing. We greatly admire some of the coloured examples of this process, but we cannot think that the pure white glass—the beauty of which is its transparency—is in any respect improved by silvering.

The illustrations of *engraving on glass* were numerous, and many of them exceedingly beautiful. We particularly admired some of the specimens by Mr. Kidd, of his new process for illuminating, embroidering, and silvering flat surfaces. All the designs are cut on the under face of the glass, and then being silvered, are thrown up in a very pleasing manner, producing an optical deception of an interesting character. In many of the engraved specimens we have the very beautiful effect of cutting through several surfaces to coloured glass, down to the translucent body. The opaque glass coating, which may be produced either by mixing oxide of tin or arsenic with the glass, is first laid over the crystal; then on this is applied the ruby glass, and where the ruby has been produced by gold the result is most satisfactory. These, being cut through, present the three surfaces in any way which may be decided on by the artist. Rice Harris and Son's pressed glass is of the greatest interest. By pressing into moulds, this elegant material is produced to the public in useful and symmetrical forms, at prices considerably below those at which cut flint glass could possibly be offered. Many of the specimens of pressed glass exhibited, have a degree of sharpness in all the ornamental parts which renders it difficult, without a close examination, to say whether or not they have been subjected to the operation of the glass-cutter's wheel.

Among other new applications of this process of pressing glass into form, Messrs. Powell and Sons, of the Whitefriars Glass-works, exhibited their patent pressed glass for windows. There is much novelty and ingenuity in this. The pattern is pressed in the glass, and then, by a subsequent process, glass of another colour is flowed into it; the whole is then ground down to a uniform surface, and the result is an inlaid pattern of glass of one colour, in glass of another. The windows formed in this manner are very effective; and it appears to us that they realise the results which in stained glass are only obtained by the long-continued action of the atmosphere and light. None of our modern church windows realise that "dim religious light" which is peculiar to those older fanes standing as memorials of the piety of our forefathers. The light permeating the modern windows suffers ordinary chromatic analysis, and falls upon the floor in well-defined colour, and the outline of the design can be easily traced. In those of olden time the colours fall blended; there is a general diffusion of tones; no one colour coming out more decidedly than another. Upon examining old glass windows it will be found that the utmost pains had been taken to secure this effect: the glass is often purposely roughened; frequently pieces of different colours are blended; but still the action of time and the abrasion of the exposed surface is the important agent to which the harmonious effect is due. Messrs. Hardman and Co. have had glass manufactured purposely to endeavour to imitate the required condition of the mediæval styles, and in many of their windows they have been eminently successful.

The antiquity of pressed glass is very remarkable. The Assyrians, the Egyptians, the Greeks, and the Romans all adopted the process of pressing or squeezing the glsss, when it was in a pasty state, into moulds. Some fine examples of this will be found amongst the glass series in the Museum of Practical Geology.

The examples of plate glass were exceedingly good. The Thames Plate Glass-works exhibited at the western end of the building the largest glass plate hitherto manufactured. The examples of British plate which are found in the Spitalfields trophy are beautiful specimens of this class of manufacture.

On the whole, the glass manufacture of the Exhibition—commencing with the sands, alkalies, and models, and terminating with the great Glass Palace itself, and its fancy fountain—is exceedingly complete, and of the highest interest.

THE GREAT EXHIBITION.—THE AWARDS OF THE PRIZES.

(FROM THE ILLUSTRATED LONDON NEWS.)

THAT a limited number of prizes should be allotted amongst 17,000 candidates, by any body of men, however immaculate, however profound in judgment, in a manner to give satisfaction to everybody, was hardly to be expected. Such a result could not have entered into the wildest dreams of the most Utopian votary of universal harmony. We were well prepared, therefore, to find that the awards of the juries in the Great Exhibition contest should give rise to much animated contention; but we were also supported by the hope that their decisions would have been such as, after free discussion, to meet with a general and conscientious support from the majority of the public. Such was our view of the difficulties inseparable from the case, such our hope of the conclusion to be arrived at. We regret to say, and it would be useless and vain to disguise it, we have in all this been grievously disappointed. If universal contentment was scarcely to be aimed at, much less expected, such general, such wholesale discontent, at the closing procedure of those intrusted with responsible authority in the affairs of the Great Exhibition of Industry of all Nations of 1851, was hardly to be apprehended, as that which has already begun to visit the contents of the ominous-looking packet, delivered to the Prince President on that cold damp morning of the 15th of October, when, in almost solemn silence, the public business of the Royal Commission was brought to a close.

Wishing to deal with this subject with the gravity and in the coolness of temper which its importance to the whole industrial community of the world demanded, we abstained from making any comment in our last publication; considering that what it took thirty-four juries, of five and upwards each, nearly six months to agree upon and propound, might well require as many days for the journalist to examine and understand. It was hardly possible, we thought, for any man to arrive at a correct conclusion upon the value and justness of so voluminous a report as that presented, a report comprising five thousand names, without some days' deliberation;—the malversation must indeed be flagrant and palpable, which could be detected upon a first blush of the document; and, therefore, although many murmurs of discontent on the one part, many suggestions of successful diplomacy on the other, in respect to these awards, had, during many weeks past, from time to time reached us, we preferred holding ourselves unprejudiced in the matter, in order to form our ultimate opinion upon an inspection of the actual decisions, coupled with our own knowledge of the facts. In this spirit we now proceed to consider the conduct of the Commissioners of the Great Exhibition and their delegates, in the all-important matter of the Adjudication of Prizes.

And, in the first place, a word about the prizes themselves, which, although the closing honours of the whole proceeding, were, as we all must remember, held out as a primary object and inducement at the commencement of the undertaking.

We are not now going to discuss in the abstract, whether, in an international competition of industry, money rewards of considerable value, or mere honorary awards whose value must depend entirely upon the circumstances under which they are allotted, are the most desirable, and the most likely to bring about the object held in view. Our opinion, however, is in favour of a certain amount of money rewards in good round sums, in conjunction with honorary prizes: the former to be considered as premiums for a contribution of actual value to the whole community (accomplished, perhaps, at considerable cost to the producer); the latter as testimonials of individual merit, conducing eventually to the profit of the individual producer.

And, whether or not we are right in this view of the case, it was that adopted as the very basis of the Exposition of 1851; it was that confirmed in the most authoritative manner by the patent by which the Royal Commission was appointed. And it was so adopted upon grounds which are plainly set forth in the minutes of the meeting at Osborne, on the 1st July, 1849, thus recorded:—

"The Prizes proposed, to be submitted for the consideration of the Commission of Medals, and *money prizes so large as to overcome the scruples and prejudices even of the largest and richest manufacturers, and ensure the greatest amount of exertion. The first prize to be 5000l.; and, one at least, of 1000l. to be given in each of the four sections. Medals conferred by the Queen would very much enhance the value of the prizes.*"

Here are money Prizes announced, and announced as inducements to individuals to support the project—money prizes to the amount of 9000l. at the least, besides "medals conferred by the Queen." But that this was not the limit of pecuniary rewards at that time contemplated by the promoters, appears by the very words of the patent appointing the Royal Commission (dated Jan. 3, 1850), the premises of which, recited that 20,000l. had been actually invested in the hands of trustees by the Society of Arts for the purpose of being distributed in Prizes, such sum being named as the minimum amount which it would be proper to devote in that manner as an inducement to manufacturers to come forward in competition with their best and most expensive works.

Such was the original intention of the Society of Arts, such was the scheme which was confirmed by Royal patent; and we hold that it was no unimportant feature in the affair, inasmuch as the estimates of the probable cost or risk of the whole undertaking, upon the strength of which

the public was appealed to for subscriptions, included this 20,000*l.* for Prizes as a specific item, the gross estimate being about 80,000*l.* And to that appeal the public, though not without misgivings, replied by sending in subscriptions to the amount of 76,600*l.*, of which 64,500*l.* had been paid up before the opening of the Exhibition, and at a time when its profitable issue was still a matter of question.

Such was the original scheme; how different has been that actually carried out, every one knows, as we said before. With respect to the abstract policy of the change decided upon in the nature and adjudication of the Prizes, we have not now to speak. It might be quite competent to a body of Commissioners, acting in a matter purely their own, and disposing of their own, to do so in any way they thought most conducive to the object they considered it desirable to attain; it might have been quite competent to them, in such case, to have substituted an unlimited number of bronze medals for a minimum amount of money prizes, in addition to medals. But how stands the question with regard to those who contributed their money to make up the required amount for the Exhibition and its announced money prizes? how stands the question with the manufacturers and other producers, who at great expense, and at great cost of labour, were induced to prepare objects for exposition upon the inducement of a possible reward in one of those money prizes?

This is a very delicate question—money matters always are—and we will not now discuss it further. We will only, with very great deference, submit that the abandonment of the large money prizes distinctly announced in the premises of the Royal patent is morally, if not legally, a fatal departure from its purpose, at least in as far as the liability of voluntary subscribers is concerned; and we will add, that nothing could justify the alteration of policy limiting the rewards to a distribution of bronze medals, except its signal and entire success.

A review of the minutes in which the altered scheme of prizes was announced, followed by a careful consideration of the address of Viscount Canning as the head of the jury department, convinces us, that, in this very important matter—a matter involving the only tangible result of the whole proceeding—neither the Commissioners nor the Juries had arrived at any definite notions either as to what should be rewarded, or the scale of rewards to be apportioned. At the very outset of their labours, indeed, the jurors appear to have been restricted from rewarding merit according to its degree or relative importance. It was originally intended that there should be three medals: the first, for the highest degree of merit, to be awarded only by the general body, the second for superior merit, and the third for merit in a less degree—both the latter to be at the disposition of the several juries. But such a disposition of awards soon became inconsistent with an instruction from the Commissioners which at the very outset obstructed the proceedings of the juries. Viscount Canning, in his address, states:—

"The Council of Chairmen, in proceeding to the discharge of their duties, were met at the outset by a serious difficulty. Her Majesty's Commissioners had expressed themselves desirous that *merit should be rewarded wherever it presented itself, but anxious at the same time to avoid the recognition of competition between individual exhibitors.* They had also decided that the prizes should consist of three medals of different sizes; and that these should be awarded, not as first, second, and third in degree for the same class of subjects and merit, but as marking merit of different kinds and character.

"The Council of Chairmen found, to their regret, that it would be impossible to lay down any rules for the awarding of the medals, by which *the appearance at least of denoting different degrees of success amongst exhibitors in the same branch of production could be avoided.* Accordingly, after fully explaining their difficulty to her Majesty's Commissioners, they requested, as a course by which it might be materially diminished, that one of the medals might be withdrawn. Of the remaining two, they suggested that one, the Prize Medal, should be conferred *wherever a certain standard of excellence in production or workmanship had been obtained*—utility, beauty, cheapness, adaptation to particular markets, and other elements of merit being taken into consideration according to the nature of the object; and they recommended that this medal should be awarded by the juries, subject to confirmation by the groups."

The English of this is unfortunately too plain. The juries having obtained authority to distribute medals just as they would halfpence in the streets—"wherever a certain (*qu.* uncertain) standard of excellence" presented itself—had absolutely abnegated their responsibility as jurors between candidate and candidate; their value of the "prize" as a test of "superior merit" was gone, and a general scramble ensued, in which the attainment of a medal might be profitable to the small publicity-hunting trader, but could never be "honourable" to the man engaged in any of the higher branches of discovery or enterprise.

The Council of Chairmen seem to have been early aware of this inevitable result of the abandonment of a portion of their functions; and, accordingly, Lord Canning says:—

"In regard to the other and larger medal, they suggested that the conditions of its award should be *some important novelty of invention or application, either in material or processes of manufacture,* or *originality combined with great* BEAUTY of DESIGN; but that it should NOT be conferred for excellence of production or workmanship alone, however eminent: and they further suggested that this medal should be awarded by the Council of Chairmen, *upon the recommendation of a jury supported by its group.*"

The proceeding was still further mystified by a device adopted by the jurors, at their own instance; who, although they would not undertake to apportion two distinct classes of bronze medals, yet attempted to distinguish between two classes of merit. The "prize medals," unlimited in number, almost unconditional in their application, were not sufficient to mark the very ordinary level of merit required of the recipients, and accordingly:—

"The juries have found it just (says Lord Canning), in framing their report, to make *honourable mention* of certain exhibitors whose contributions were *not such as to entitle them to receive a medal.*"

It only wanted this to crown the adjudication of awards with ridicule; and to render their value something more than questionable. Let those who feel aggrieved at being denied one of the 170 "Council medals," and thrown into the common lot of 3384 "Prize medal" recipients, consider the feelings of the 2012 who are condemned to put up with "honourable mention."

It will be curious one day to endeavour to ascertain the line by which the juries separated the "Prize medal" class from those entitled to "honourable mention." At present, a few instances of both, the result of a very cursory examination, must suffice. The exhibitor of "a well-made shirt" from the United States, of "lamb's tail oil," of a "clay tobacco-pipe," of a "wedding cake," of a "box of sweetmeats," of a "walking-stick," of "a pail," of "a broom," receives a medal of equal value with that awarded for the crystal fountain of Messrs. Osler, the pianofortes of Messrs. Broadwood and Messrs. Collard, the railway break of Mr. Lee, the porcelain and statuary of Mr. Copeland, the vertical printing-machine of Applegath, the new motive power and other valuable inventions of Ericsson, the nationally-important and commercially-valuable processes in the preparation of flax of Claussen, the compensated balance of Loseby, the wood-carving of Rogers and Wallis, &c.

Amongst the crowd of subjects which have been put off with "honourable mention," we find "amber cigar mouth-pieces," "canes of ram's-horn," "toilet soaps," "toys," "clay pipes," guns, pistols, photographs, &c. We find, also, Fowler's draining-plough, Shepherd's electric clock escapement, "a violin combining quality and cheapness," Banting's "collection of furniture" (including one of the best sideboards and one of the handsomest tables in the Exhibition); Heywood, Higginbottom, and Co., new and important process for producing paper-hangings by machinery. We find, also, Behnes' "Startled Nymph," and some other of, to our mind, the best, pieces of sculpture exhibited.

And as we have come down to the Sculpture department, which enters into Class 30, we shall, by way of making an end to our present article endeavour to investigate the principles upon which the three classes of awards (including the Council medal) have been made as instanced in this branch of production. Now, what this medal was intended to effect, or how it was to be applied, we have no very clear notion from the official statement of the Chairman of the Council of Juries; but we are very distinctly informed by his Lordship of the nature of certain cases in which it was considered necessary to withhold it; and this must suffice as our guide for the present. Viscount Canning states:—

"It was to be expected, that cases would arise in which the Council medal, as the higher reward, would be asked for exhibitors whose claims were *only somewhat stronger in degree, without differing in kind* from those of others to whom the Prize medal had been awarded. In such cases it became the duty of the Council of Chairmen to refuse their sanction to the award of the Council medal, without, however, necessarily impugning the alleged superiority of the article for which it was demanded. On the other hand, some instances have occurred in which they have felt themselves called upon to confirm the claim to a Council medal where the object for which it is claimed showed, in itself, less merit of execution or manufacture than others of its class. It follows, therefore, that the award of a Council medal does not necessarily stamp its recipient as a better manufacturer or producer than others who have received the Prize medal. It is rather a mark of *such invention, ingenuity, or originality, as may be expected to exercise an influence upon industry more extended and more important than could be produced by mere excellence of manufacture.*"

Taking these observations as our rule and guide, we ask what the Council of Chairman saw in Marochetti's plaster figure of Richard Cœur de Lion—what in Kiss's Amazon—what in Pradier's Phryne—what, even, in the late R. Wyatt's beautiful nymph Glycera, to call for a Council medal; when Debay's Eve, Bell's Falkland, Simonis' Godfrey de Bouillon, and Watson's portrait statue of Flaxman are sufficiently rewarded with a prize medal!—when Behnes' Startled Nymph, Engel's Group of Amazons, Klingsby's (Denmark) ivory casket, Miller's Orphan, Nencini's Bacchus, are got rid of with "honourable mention?"—and when Gibson's Greek Hunter,* Campbell's Muse, Max's Hagar and Ishmael, received neither Council medal, Prize medal, nor honourable mention!

It is impossible to reconcile such glaring inconsistencies as the above with any rule of common sense or common purpose; and the only consolation we could hope to bring to the irritated and bewildered candidates, whose pretensions have been thus dealt with, would be by recurring to the emphatic words with which Mr. Cole, six months ago, closed his introduction to the Official Catalogue:—"The work is done, and the collection made of the productions of 15,000 exhibitors, working with the ability God hath given them. To these we may say with St. Paul—'In lowliness of mind let each esteem others better than themselves.'"

* In the case of Mr. Gibson, our cotemporary appears to have overlooked the fact that that gentleman, being on the jury, could not receive a prize.—ED. C. P.

TELESCOPE FUNNEL FOR STEAM-BOILERS.

Mr. R. Taplin, of H.M. Dock-Yard, Woolwich, exhibits a "Model of a telescope funnel or chimney for marine boilers." By this design, it is intended to strike the chimney and waste steam-pipe of any steam-vessel, from the highest elevation, level with the upper deck, or even below it, if required. By this means the deck may be freed from such encumbrance, at the particular times when, by dispensing with the usual height, neither the working of the engines nor the boiler will be prejudicially affected; whilst the vessel, having full command over her sails, may use them instead of steam to greater advantage than has hitherto been accomplished, the chimney being entirely removed, and not partially so, as is the case with all steam-ships as now fitted. Hitherto the chimneys of steam-vessels have been so constructed as to admit of but one sliding part, which, when struck to the lowest possible position, generally presents an unavoidable altitude of many feet above the deck, thus adding to other disadvantages that of presenting resistance surface to the air when under sail. It is presumed that the screw-ship would find this compound sliding-funnel a desideratum, particularly when not only an unsightly funnel, but even masts, rigging, and their appendages, might be considered inexpedient to be retained, and when the hull only should be seen floating on the water, in order to achieve some important enterprise by approaching an object unobserved. In such case, a smokeless coal or coke might be used, the products of combustion escaping from the chimney, though struck level with the deck, and being perfectly harmless to the crew of the vessel. The compound funnel may be composed of any reasonable number of sliding parts, and yet the entire series may be raised or lowered simultaneously, in less time than an ordinary single telescope funnel, and this by means of a series of guide pulleys and chains, worked by a winch.

THE FAITHFUL MESSENGER.—GEEFS OF ANTWERP.

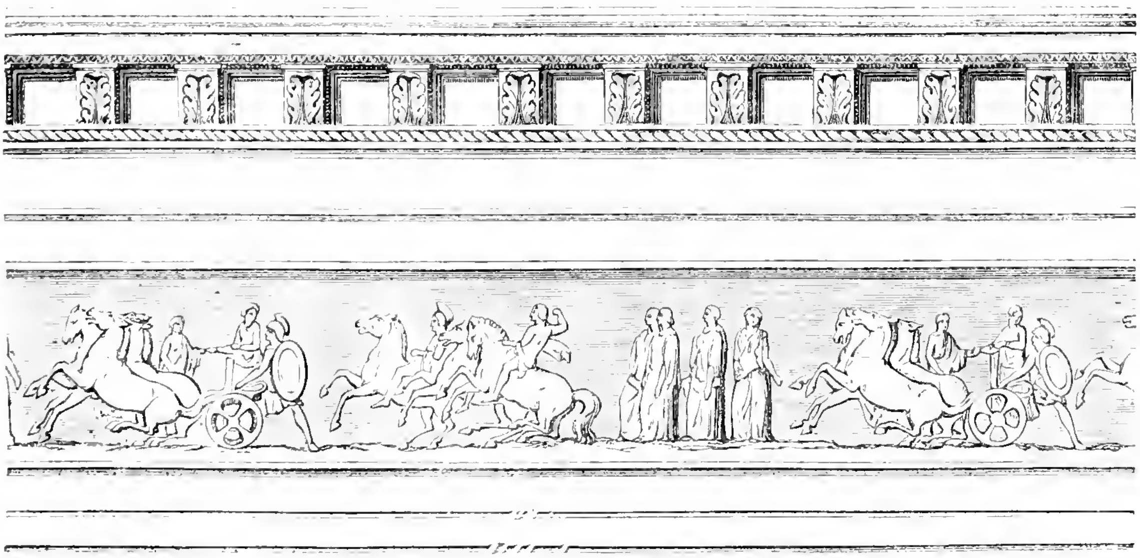
HOSKING'S IMPROVED VALVE FOR PUMPS.

Mr. R. Hosking, of the Perran Foundry, Cornwall, has an excellent specimen of a "valve applicable for large pumps, divided into several parts, so as to avoid the risk of breaking by concussion, the different parts shutting in succession." A vertical section of this valve in its open state was exhibited; the lifting portion in this example were two in number, the water passing through their annular spaces. In this way, not only is the water-way increased, but the valve action is made almost noiseless, and quite free from objectionable concussion — important advantages, which have hitherto been quite unattainable in one valve, because, to reduce concussion, the water-way has always been narrowed. The water in Mr. Hosking's valve gets clear away near the centre of the column; and as the valve-lift is always in proportion to its area, the system of division constitutes each section a separate valve, shutting at different intervals, and the lift is thus so reduced that the shock in dropping is scarcely perceptible. Cornish engineers have taught us many lessons in mechanical engineering, and this one on pump-valves is by no means of the least importance.

PAPER PATTERN.

BY JEFFREY AND ALLEN.

This is a very handsome frieze in paperhangings by Jeffrey and Allen. The subjects are copied from portions of the Elgin frieze, and represented without repetition in the entire length of 24 feet. The effect of the chiaroscuro is very good; approaching to that of actual relief in stucco.



FRIEZE OF PAPER PATTERN. BY JEFFREY AND ALLEN.

THE FAITHFUL MESSENGER.

BY J. GEEFS, OF ANTWERP.

We have here a very pretty little piece of sentiment, very pleasingly treated. An expression of softness pervades the whole; the hair and drapery are light, and gracefully disposed; in fact, the material, which is marble, has been successfully handled in every part.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

SCULPTURE.

THE AUSTRIAN SCULPTURE ROOM.

WE intend in the present article to devote our attention to some of the works of sculpture by foreign artists exhibited in the Crystal Palace. Although old Rome would of prescriptive courtesy claim our attention first amongst the foreign contributors, the more numerous and varied display presented in the Austrian department must be our excuse for giving the latter precedence on the present occasion. The little chamber, with its ante-room, which was allotted to the various nations owing allegiance to the Imperial House of Austria, for the exposition of their productions in sculpture, was crammed full of works of the highest finish, not in plaster, but in marble, affording very interesting means of studying the actual state and the prevailing tendencies of the various schools followed by nations distinct in themselves, and some of which have had little intellectual intercourse with the older Art-fields of Europe. Not to go too deeply into generalities upon this head, we may observe, that as Milanese art occupies a sort of middle place between the colder classicism of the modern Roman school, and the wilder fancy of Germania—the more virgin minds of the central and eastern states, whilst they are not without their share of the impulses evinced by others of their day, give a hint in some of their examples of working after the models of the more ancient schools of Greece, the predecessors of those of Italy herself. In many cases there is much to condemn; experimental conceits, manipulative achievements unworthy of art, and incongruities in composition which sober judgment cannot reconcile either to the requirements of poetry or of common sense; in short, many instances of art misdirected, and marble misapplied, some of which it will be our duty to refer to more particularly as we go along. But, with all these drawbacks, there can be no question, that, viewed as a whole, the Austrian Exposition in sculpture was one of the most creditable and interesting we have ever seen brought together by contemporaneous artists.

SUSANNAH.—BY A. GALLI.

Making our way through the ante-room, we were by no means favourably impressed by a group of "Atala and Chactas," by Innocenzo Fraccaroli, of Verona, which was a common-place affair enough. This artist, we should mention, had another work of a much higher class (in the main avenue), "Achilles Wounded," the attitude of which was striking and effective, whilst the expression of pain and horror in the face, as the hero views his wounded heel, is well depicted. An attempt at exhibiting the more essential feeling of which the incident is susceptible—the full appreciation of the evil omen attaching to the mishap, would have heightened the effect, and given that touch of historic poetry to the character, of which it is now deficient.

To return to the ante room of the Austrian Gal lery: on either side of th table were two infan subjects, by Antonio Galli of Milan, and Benedett Cacciatori, of Carrar. True, the gilt ring or hal round the head of th one implies that it i intended for the Infa. Christ, whilst the othe lying on a rocky surfac is supposed to be Joh the Baptist. But the is little attempt at in pressing the divine ch

racter upon the countenances: indeed, how should it be in such mere babes as they are, and asleep too? And, divested of this, what of high or poetic interest can attach to a marble representation of a human subject before it is formed, even in the stage of boyhood, and as yet ungifted with the intelligence and impulses of our nature? In painting we have abundant instances of the introduction of the Infant Saviour, as part of what is called "the Holy Family;" but, except in some few cases where the child is depicted as already inspired with the prescience of his divine mission, and as in the act of blessing the spectator, the sanctity of the subject is generally realised by the devotional and reverential regards of the mother and bystanders, all which in the single marble subject is necessarily out of the question.

"The Vintage," by Gaetano Motelli, of Milan, is a very elaborate piece of carving, representing a whole family of cupids disporting amongst the branches of a clump of vine, making free with bunches of grapes as big as themselves, scrambling in and out, between and around them; some pressing the gathered grapes in a vat below, whilst one little fellow at the top squeezes the purple juice into his tiny mouth. The figures were shown in the round: and the whole was treated as a block or centre-piece: but we submit, with all its unquestionable beauties, that the composition is one better adapted to wood carving, or, better still, to silver, as a dinner table decoration.

A group, by Democrito Gandolfi, entitled "Grief and Faith," which stood in a prominent position at the entrance of the inner room, provoked criticism as much by the incongruities involved in its conception, as by its sins against harmony of outline and proportion in the arrangement. In the foreground—fancy a foreground in a piece of sculpture!—in the foreground is a tomb or sarcophagus of large dimensions, over which leans, covering her face in her hands, a female figure: this is "Grief," according to the commonplace types exhibited on the walls of every parish church in England, only that there the artist has generally contented himself with representing it in bas-relief, whilst here it obtrudes upon the floor in the fullest dimensions of reality. For the rest, "Faith" is represented upon a circular pedestal in the rear, in the person of a young female kneeling. This figure, we should observe, was the only tolerable bit in the whole performance, and would be pleasing enough if separated from the rest, with which, even artistically, it has no connexion. The gross error against common sense of representing a real object (the weeping female), and an ideal existence (the spirit of Faith), in the same material, and that, hard unyielding marble, must be too obvious to call for much remark. Even Reynolds was criticised for introducing in his "Death-bed of Cardinal Beaufort" the ideal presentment of the evil spirit waiting for his soul in the background; though by many he has been held to be justified, as only realising the picture presented by Shakspeare's lines descriptive of the scene. But if this was a license hardly excusable in painting, where, by means of the well-known appliances of art, the separation of the actual from the imaginative part of a subject may be clearly defined, it is one totally unjustifiable in sculpture, where the material is capable of no such modification, either by the application of colour or the interposition of aërial media.

One of the principal show-pieces in the room, and which excited the wonder of gazing thousands, is "The Veiled Vestal," by Raffaelle Monti. The ambition of the artist in this production is to represent the effect of a face seen through a veil; and so ingeniously has he managed it, that at a distance of the breadth of the room, the face—the marble face—actually looks as if it were covered with a real piece of lace. This is a triumph of mechanical dexterity certainly, but upon the value and merit of which we may have some misgivings, seeing that it achieves a greater verisimilitude of the worthless rag of a veil being to the eye reality—than of the poor face, which remains still, pale, cold stone. The ancients would never have been guilty of such profanation of their subject. 'Tis true they took pride in representing the soft outline of the limbs as rounding out and supporting the crisp light folds of the draperies of their figures, (which, by the way, they seldom liked to exhibit entirely nude, except when the case rendered it necessary): but they would certainly have torn the vestal's veil from her face before they took her portrait, or would have abandoned her altogether as a subject. So much for the ancients, who can well take care of themselves. Proceeding to a nearer examination of Signor Monti's performance, we found, as we suspected, indeed knew must be the case, that his veil effect was a mere trick of art, and a trick practised to the utter destruction of the beauty of his vestal's face, whether seen from afar or near. Artfully disposing the folds of the veil, and making them generally very broad on the outer parts, and very narrow, nay, almost vanishing, on the inner parts, being those next the face, he further roughed the surface of the intermediate spaces, as if the flesh were actually covered with a veil; and these surfaces seen at a distance, take the lights in such a manner, that, blending with those on the outer surfaces of the veil, they produce the general effect intended, the form of the face being dimly and indistinctly seen as through a veil. In reality, portions of it only are seen at one and the same time, and in one direction, and the effect so produced is not a genuine effect *quasi*, but a delusion; not a matter brought to the mind's eye by means of the sense of sight, but a trick played off upon the too credulous fancy at the expense of the organ of vision. Common sense and legitimate art are further outraged in this work by the introduction of a basket of *real artificial* white roses in the hands of the figure, instead of a sculptured offering in marble. The drapery generally is artificial, and the whole character of the piece unearthly and disagreeable.

There were two other examples of the same sort of trickery in the room. One entitled "A Bashful Beggar," by Democrito Gandolfi, whose "Grief and Faith" we have already noticed, represented a woman seated by the roadside, her face covered by, but partially revealed beneath, the folds of a linen drapery, in which is also wrapped the infant in her arms. More prominent, and at her feet, are two children begging. A milestone, with "Dover" on it, informs us that the party are on their travels, and an inscription on a scroll upon the ground states her sad case:—"Je suis émigrante, mère, veuve, et j'ai une aneurisme au cœur!" ("I am an emigrant—a mother—a widow—and I have an aneurism in the heart!") A very poor subject for emigration certainly! All these points show a striving after effect by illegitimate means, which pure art would disdain. The third veiled figure is smaller than either of the others, and which it may be sufficient to point out by name: it pretends to represent "A Slave in the Market," by Raffaele Monti, the artificer of the "Veiled Vestal," (engraved in No 4 of the *Crystal Palace*,) who seems to have adopted this notion as a *spécialité*. Indeed, it appears he has not been without encouragement, the "Veiled Vestal" being announced as the property of the Duke of Devonshire.

But the trick itself has not even the merit of novelty; it has been tried before, in a bad school, and at a bad age of art certainly, and has been condemned by the judicious. Two examples exist in the Church of Santa Maria della Pietà, at Naples, executed about the middle of the last century, at the instance of the Prince Raimondo di Sansevero, in honour of the memory of his father and mother. In the case of the latter, she is represented in marble, under the emblem of "Modesty." Duchesne, in the *Musée de Peinture et de Sculpture*, speaking of this work, says:—"This statue was wrought about the middle of the 18th century, by the Venetian Corradini, sculptor to the Emperor Charles VI. It then acquired great renown for the singularity of seeing a figure covered with a veil, light enough to show the full shape of the body and the features, which unfortunately are not handsome." We may add, that we remark concurrently in this work bad taste in the arrangement of the drapery, and other vices of detail, as the introduction of a garland lying across and breaking the outline of the figure. The other example referred to is a still more extravagant feat of art. It is from the chisel of Francesco Gueirolo, a Genoese sculptor, and is called the "Sinful man undeceived." "It represents," says the writer previously quoted, "the father of Prince Raimondo, partly enveloped in a net, of which he is seeking to rid himself. The artist alludes to the situation of that prince, who in the course of his life often let himself be carried away by vice; but who, at a later period, and enlightened by his genius (the good genius is represented as an angel in smaller dimensions), reverted from his errors. The net is in marble, as also the statue and all the accessories, which must have produced great difficulties in the execution, as it adheres but in a very few parts. The appearance of this coarse envelope contrasts with the high finish of the flesh parts. The difficulty overcome is the principal, and, it might be almost said, the only merit of the group."

We turn with pleasure from these *caprices* to other works of more sterling quality, which the room contains. Adjoining the "Veiled Vestal" is another work of importance by the same artist, "Eve after her Fall." The attitude and character of the figure are full of merit, the limbs graceful, well-rounded, and realising as near as may be the softness of flesh. The artist has represented the hair in massive and dishevelled tresses hanging over the face on each side; and the executive skill displayed in accomplishing this difficult point is worthy of honourable mention, though it must be added, that the soft and flexible character of the human hair—its great beauty—is somewhat sacrificed to attain the end in view. The introduction of a little Cupid peering up from amidst a cluster of roses behind, is, to say the least, a conceit rather apocryphal in itself, and, upon the whole, had better have been dispensed with.

Antonio Galli, a Milanese artist, has three works in marble:—a "Jephtha's Daughter," very pleasing in character, simple yet graceful, and the head endued with considerable expression; another, entitled "A Youth on the sea-shore;" and the third, "Susannah at the Bath," which we have engraved. The attitude and expression are well conceived, and aptly illustrate the situation of one surprised at a bath; and the general treatment is satisfactory, though the hair might have been improved, had the softness and flexibility of nature been followed, and the drapery, what little there is of it, by being lighter in material, and freer in disposition. Marchesi's "Eurydice," is also a meritorious performance; but, perhaps the sweetest and most touching effort in the room, was the little cabinet group of "Hagar and Ishmael," by Emanuel Max, of Prague. The treatment of the female figure is full of dignity and truth; the hand, thrown open as in the act of supplication, rests upon the bosom of the dying boy, whilst the steadfast and imploring look she directs to heaven reveals the whole story. All the points are finished with great delicacy and purity of handling. The same artist has a very clever bas-relief of an Amazon.

The face and figure would seem the true ideal of Amazonian *physique*, and there is prodigious energy in the action both of horse and rider. The details and accessories, which are sufficiently ample, are finished with great care, but in a style judiciously subdued; in short, in most respects, this work indicates a ripe appreciation of the purer models of antiquity, which we should be glad to find more frequently exhibited by other artists of our day.

"Ishmael," unattended by Hagar, is a subject simply painful - a poor youth in all the agonies of death from thirst; and this Signor Strazza, of Milan, has represented with terrible earnestness and reality, in a prostrate figure, life size, which occupies a prominent position in the centre of the room. No one can deny the wonderful talent displayed in the working out of this subject: the features of the face are drawn and livid under the hand of death, and the whole figure denotes helpless prostration in its last stage. But can we look upon it with any feeling but that of shuddering? and must we not regret the absence of the only redeeming and poetic feature of which the story is susceptible, and which M. Max has so beautifully and with such touching effect introduced?

Joseph Kocksznan, of Vienna, has a very pretty "Hebe," the head charmingly graceful and expressive, and the whole treatment of high excellence. We do not like so well his very tall and sentimental "Shepherd," unnecessarily denuded; nor his "Flora," who is too artificial in her attitude, and overburthened with a heavy garland of flowers extending from head to foot. Nevertheless, the face of the latter is pleasing enough.

THE EXHIBITION AS A SCHOOL OF INDUSTRY.

(FROM THE "ARCHITECTURAL QUARTERLY REVIEW.")

TO pursue the difficult question of the tendency of mechanical production, and the influence of increased facilities upon the condition of the workman, would involve us in a greater length than we propose in this present article. Unquestionably, the immediate results are often suffering and hardship to individual workmen, and often to a whole trade. But we cannot quite address ourselves to the logic of arguments, that improved modes of production, which confessedly place the article within the reach of a greater number, are to be retarded in order to benefit a minority; that the course of science is to be checked; that knowledge is baneful; and that either particular modes of production, or particular habits and manners in men, are to be kept up solely for the existence of particular trades and particular classes of artisans. Moreover, those who enter into those arguments are prepared to show, that the social machine rights itself in a much shorter time than might have been anticipated. We well recollect the fearful prognostications at the commencement of the railway system. Caricatures of distracted innkeepers and delighted horses were to be seen; and what was shown in caricature was true, at least for the time, as to the innkeepers. The coaching glories of Lichfield, Northampton, and St. Alban's, passed to places which had been too small to dread railways; new towns rose with wonderful rapidity, and the old became melancholy and deserted. We need not tell what every one knows; though let the artisan class bear in mind, that from the development of the railway system a great amount of new employment has been gained, and families once struggling against reverse of fortune are now contented and happy. And if we say that the very innkeepers and horses had soon more to do than ever before, and that towns which had rejected railways got looped in, bitterly lamenting, then we shall have simply told the story of the last sixteen years. But the moral we cannot omit. It is, that the antidote to these temporary hardships must be supplied by education, by the development of *mind* in the workman; and for this antidote the means exist in this Exhibition. By debasing the workman to a mere machine, it has followed necessarily that the human machine was superseded, sooner or later, by the superior mechanism which springs from mind. Immediate advantages of concentration of attention and subdivision of labour were the limitation; and it may not unreasonably be inferred, that the recent prevalence of insanity even has been the result. Improved education, and the development of mental energy, would not only lead to the discovery of new sources of employment, indispensable in a state of progress, but would, at the same time, substitute an honest pride and pleasure in the perfect execution of even mechanical work, the increasing want of which is a main cause of the inferiority of many works of art, and a constant source of annoyance to architects, and loss in buildings to the public. From the brickwork and joiners' work, or ironmongery in a house, down to a chair or an umbrella, lowness of price without the asserted durability, is universal; and the ingenuity, and even pleasure, which both dealers and workmen evince in the practice of a deception, is equalled by the readiness of the public to deceive themselves. As we cannot grasp the reasoning of a Chancellor of the Exchequer, that because *chicory* is sold, *coffee* has been available to a class which had not before used it, so we regret the prevalence of the delusion which exists in buildings as in every other commodity. Many amongst the class of building artisans appear to disregard directions as to work, for the mere pleasure of practising a deceit. For this pleasure, we must substitute the pride of producing good work, and this antidote, we repeat, may be found in this Exhibition. We could have hoped that the influence of the Exhibition would have been exerted in the removal of a delusion before referred to, namely, that expense and elaborate work are *indispensable* to the production of beauty. Beautiful, indeed, and suggestive as are many of the objects of the Exhibition, there appears to be an entire absence of that cheap beauty which would be within the reach of all classes. The attainment of this object would have been the more desirable, since recent attempts to extend the influence of Art, in association with objects of decoration and utility, have fostered rather than discouraged the delusion, and so have not advanced the objects of those who have made them. What has to be done, in fact, is to invest every form of utility with the attributes of ART, and this alike from the most elaborate work of architecture, to the least important article of furniture, or the meanest utensil. Certain principles which have to be kept in view are alike in all these cases. They correspond with those which the most enlightened artists are endeavouring to bring to the regeneration of architecture; they are in many respects distinct from those which determine the forms of painting and sculpture, and, perhaps, have never yet been accurately perceived and exemplified in the architecture of any age. They depend, indeed, upon the constant recognition of the fact, that the reason must be satisfied, as well as the eye delighted: and the want of this recognition is the great fault in the numerous designs for decorative objects, now held up to notice as excellent works of art. We think that the Exhibition may be made the means not only of contributing to the advancement of architecture, but of placing it in a position in which it has never yet stood; but there are particular circumstances in connexion with manufactured art which should be guarded against, although not precisely in the manner urged by those who deny the value of multiplication of copies. As for the collection of grates, ironmongery, furniture, and all those objects which afford interest to the architect, they cannot be viewed without advantage,—since the greatest difficulty is often felt in obtaining knowledge of the existence of particular inventions and contrivances. As a complete collection of these things, the Exhibition is, of course, not to be regarded. It is from the uses of the Exhibition, on which we have dwelt above, that its chief value will be felt.

DISPOSAL OF THE EXHIBITION SURPLUS.

REPORT OF THE ROYAL COMMISSIONERS.

ON the 6th of Nov., instant, the Commissioners met, and agreed to a report to her Majesty, from which it appears that the total receipts, including subscriptions, have been 505,000*l*., and the available surplus, after defraying all expenses, will be 150,000*l*. The Commissioners are of opinion that the most appropriate purpose to which the surplus funds could be applied, would be one which would increase the means of industrial education, and extend the influence of science and art on industry. As yet, however, they have not devised any specific plan for carrying out these objects; nor will they be in a condition to do so, until they obtain further powers by royal charter from her Majesty.

The report states the gross income to have been derived as follows:—

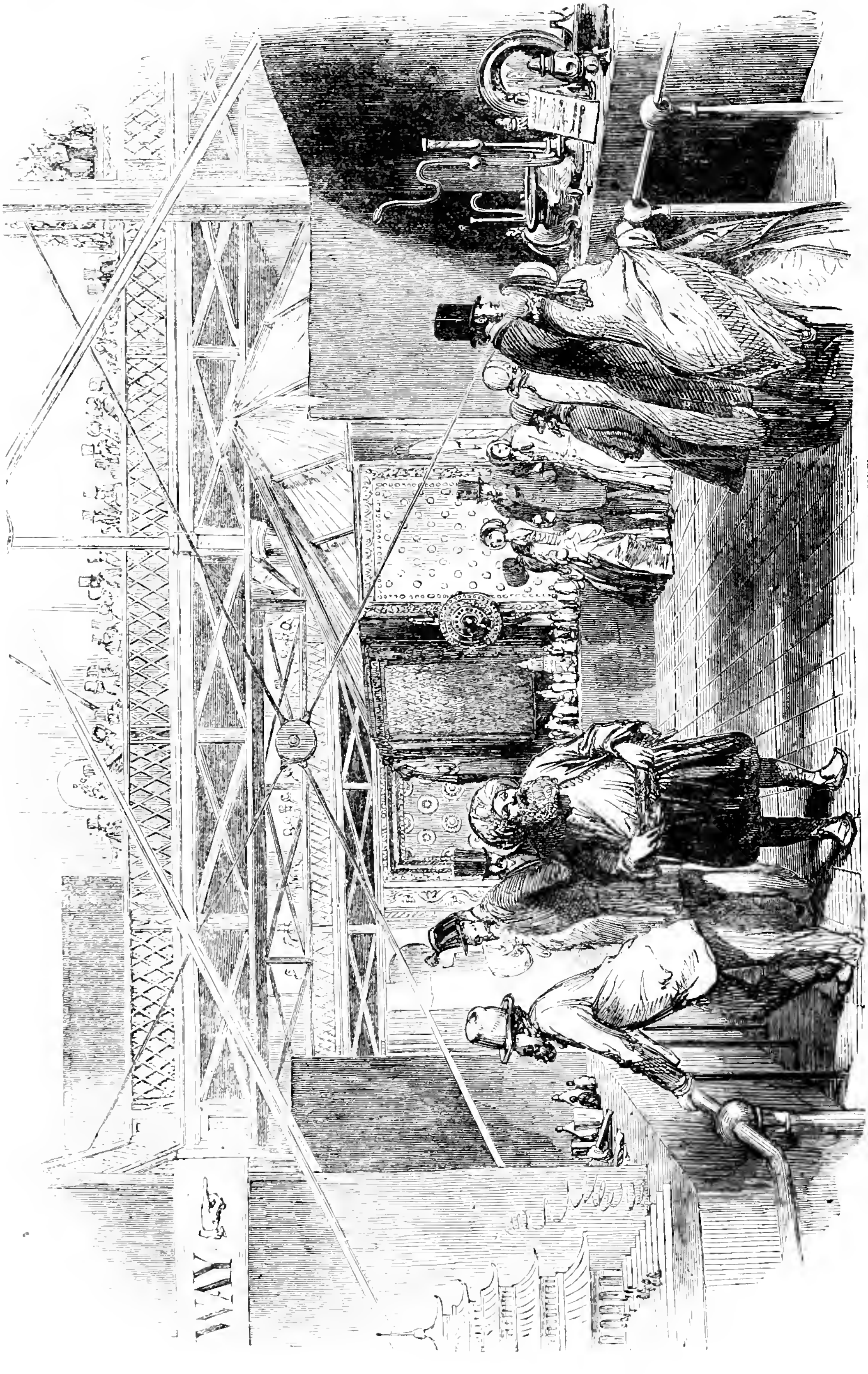
Subscriptions	£67,400
Entrance fees	424,400
Casual receipts	13,200
Total	£505,000

With regard to the future, the report states:—

"The subscriptions were derived, with few exceptions, solely from your Majesty's subjects, and were made after a public announcement, that they must be 'absolute and definite,' but that should any surplus remain, it was the intention of her Majesty's commissioners 'to apply the same to purposes strictly in connexion with the ends of the Exhibition, or for the establishment of similar exhibitions for the future.'

"We humbly beg to represent to your Majesty, that we are of opinion that it is not advisable to apply the surplus to the last-named purpose. Considering that the Exhibition which has just closed has afforded ample proof that an undertaking of this kind can be made self-supporting, and that it may safely be left to the public again to provide, when required, the means of meeting the preliminary expenses—considering also the impossibility of fixing long beforehand any definite period for the repetition of such an Exhibition, which requires for its success so many concurrent circumstances—we are of opinion that greater benefit may be derived by the public from a judicious application in the interval of the means at our disposal to the furtherance of the general objects for which the Exhibition was designed, in such a manner that the advantages which may be obtained should not be confined solely to your Majesty's subjects, but should be shared, as far as it may be possible, by other countries.

"Your Majesty's commissioners are of opinion, that no measures could be so strictly in accordance with the ends of the Exhibition as those which may increase the means of industrial education, and extend the influence of science and art upon productive industry. We are fully aware of the difficulty of devising a comprehensive plan to meet these objects; should the view, however, which we have taken as to the manner of fulfilling our pledges, meet with your Majesty's approbation, we beg to assure your Majesty that we shall give our fullest and most careful consideration to this important subject, and we would suggest that full time should be afforded us to consider and mature such a plan as we should feel warranted in laying before your Majesty, the more so as from the disproportion between the end proposed and the means at present applicable to it, much will depend on the extent of co-operation we may receive from the public."



THE EAST INDIAN DEPARTMENT.—NORTHERN COURT.

FOREIGN AND COLONIAL DEPARTMENTS.

THE EAST INDIES.—No. 2.

THE EAST INDIAN COURTS.

THE contents of the East Indian Courts, situate on either side of the Western Nave, at its point of junction with the Transept, were rich and varied in character, and were interesting in the highest degree, as illustrative of the natural resources of a large territory — resources which, except for articles of show and luxury, have as yet experienced a very slight degree of development. Turning our attention to the Northern Court, we come first upon a collection of utensils in brass, copper, and pottery, all highly curious, especially some which are used by the Hindoos in the worship and service of their idols. The utensils in iron, inlaid with silver, amongst which is a large hookah, are very elegant in form, and of highly finished workmanship. Proceeding to the rear, or extreme north of this department, we were first struck with a great variety of ornaments, fruit, flowers, &c., in wax. Two ivory chairs, inlaid, from the Rajah of Vizianagram, stood conspicuously here. At this point and around were glass cases filled with specimens of agate and jasper, both in slabs and fashioned into a great variety of objects of adornment and utility. In other parts of this room were some very admirable specimens of carved furniture, in black wood, from Bombay, and of carved boxes and ornaments in sandalwood, from Mangalore; carvings in ivory, from Morstedabad; samples of embossed paper and illuminated writings, forwarded by the king of Oude; and a variety of articles of eminent and unique beauty, in which the minute and patient industry of the native Hindoo is pleasingly illustrated. Against the north wall of the inner room were two chairs and a couch, of Rajpootana white marble, the backs of which were remarkably fine specimens of open carving. In the centre was a royal state bedstead from Benares, the curtains of which were of purple muslin, richly embroidered.

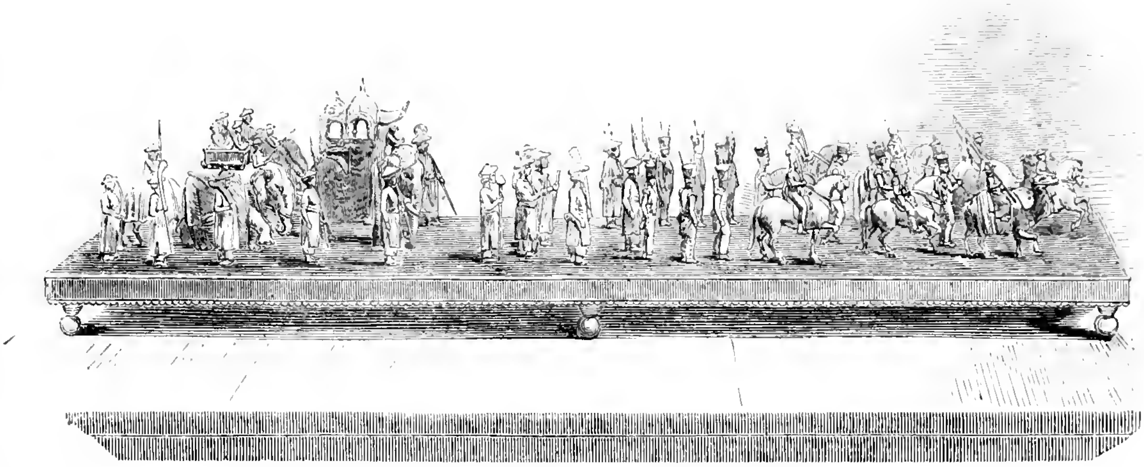
One of the most striking features in the Indian collection was a room furnished in the style of an Indian palace, in which all that romance has said of Oriental luxury and gorgeous display was more than realised. Around it, externally, were a large collection of figures, illustrating the various trades and castes of the Hindoos; rich shawls, carpets, matting,

mixed fabrics, &c., &c. Nor must the various objects of natural produce, vegetable, animal and mineral, be overlooked; for, though less striking, upon picturesque grounds, than many we have more particularly referred to in the above observations, they are perhaps of even higher interest to the future destinies of our vast Indian empire.

CLAY MODELS OF HINDOO CASTES AND TRADES.

STATE OF AGRICULTURE AND LABOUR IN THE EAST INDIES.

The collection of machines, tools, manufactures, and models of the various trades and callings of the natives of India, afford a series of illustrations of the condition of that extraordinary country, which cannot be passed over in a few words. Among the manufactures are specimens of purely native work, and of imitations or copies from European models. From an examination of the latter, it is quite plain that the native Indians are as capable of learning improvements in mechanical arts as Europeans; while both in jewellery and in weaving there are specimens which the best European mechanics would have great difficulty in equalling. But when we turn to the agricultural implements and tools used by mechanics, at first sight it seems extraordinary that no advance should have been made for centuries. The Hindoos of the present day seem to have had handed down to them an unbroken legacy of the agricultural and manufacturing arts of the ancient Egyptians. A comparison of the models in the East Indian collection with the drawings of the same kind of implements in use among the Egyptians, affords a number of very curious coincidences. But, without tracing back the history of these agricultural tools to such very remote periods, we find, by Abul Fazl's chronicle of the reign of the Megul



IVORY CARVING.—PROCESSION OF A NATIVE INDIAN PRINCE—FROM MORSHEDABAD.

INDIAN STATE BARGE.—CARVED IN IVORY AT MORSHEDABAD.

Emperor Akbar, that, 300 years ago, rice, wheat, sugar, indigo, hemp, sugar-cane, and cotton were cultivated with at least as much skill as at the present day; as high a rent was paid for land; and the numerous regulations on the subject of irrigation, and the allowances to cultivators under losses, and the estimates of revenue raised given by Abul Fazl, show that a great part of central India was under regular cultivation.

Why this people have made so little progress, why the great bulk of them are in the same condition, moral, social, and intellectual, that they were in 300 years ago, is a question too large to be discussed here; but we may venture to point out certain obvious reasons. The first is to be found in the narrowness of their wants. Look at the army of little figures, modelled from life, representing various trades and callings, chiefly in Bengal, which were exhibited in the north bay of the Indian collection, and observe how little these people need, how few are their incentives to exertion. Putting out of the question domestic servants, like the butler and groom, whose clothes are part of their master's state, it will be seen that the native rural population need scarcely any clothes. The gardener, the shepherd, the village waterman, the carpenter, the blacksmith, the ploughman, the waggoner, and a number of others of the same rank, wear nothing except a cap or turban (the Hindoos have adopted the turban from their Mahommedan conquerors), and a piece of cloth round their loins, which is occasionally used rather as an ornament then a covering, thrown like a Highlander's plaid over one shoulder. Oil—to obtain which, linseed, sesamum, and palma Christi are largely cultivated—is liberally applied to their naked skins, in the place of those coats, breeches, waistcoats, shirts, and stockings, which so largely absorb the funds, and employ the population, of the inhabitants of colder climates.

What would the Great Exhibition have been, in the two great displays of machinery and textile manufactures, if we dressed like the Indian population?

The Zemindars and great Indian gentlemen hold the same feelings with respect to garments as their subjects and tenants. Clothes, with them, are ornaments, not necessaries. After appearing in public blazing in jewellery, in shawls of countless price, and gold-embroidered silks, on an elephant or a prancing Arab, as represented in the model of an Indian fair: an Indian Prince, Sir Thomas Munro tells us, will pull off everything, and sit semi-nude in a calico wrapper, just in the same manner that we Europeans relax in slippers and dressing-gown. Magnificent embroidered shirts and shawls, like those hung up in the Indian tent, are often heirlooms in a native gentleman's family.

Then again, the system of vegetable food, cooked in the simplest manner, promotes an economy which is very much opposed to the commerce and competition on which improvement rests. But the chief cause of the stagnation of mechanical arts in the interior of India (leaving out the question of religious influences) is to be found in the extraordinary state of isolation in which the rural population live.

There are no made roads in the interior of India; where the natural roads are sufficiently good, carts drawn by one, two, up to twelve bullocks, cows, or buffaloes are employed; and excellently well constructed for the purpose are these carts or drays for ascending or descending precipitous hills, with the small weak cattle of the country, as was to be seen in the models in the southern bay. But it is only for short distances, or in the neighbourhood of great towns, where roads have been made, that carts can be used at all. The chief mode of conveying produce and merchandise in India is on bullocks' backs. In the north bay, a set of models of loaded pack bullocks was exhibited. In the rainy season, when for an uncertain number of months the rain pours down in a deluge, travelling with merchandise or produce becomes all but impossible; dry water-courses grow into dangerous torrents, and villages cannot depend on supplies from their neighbours. The evils of this geographical isolation are to a certain extent alleviated by a system which discourages intercourse between village and village.

The rural population of India is not spread over the country in detached dwellings, but lives collected in small villages or towns, for protection against robbers and wild beasts, and are each in themselves miniature commonwealths. They are like islands, with very little external commerce and no internal competition. The mechanical arts and several other callings are placed in the hands of parties who are public officials. The blacksmith, the carpenter, the potter, the ropemaker, the shoemaker, as well as the water-carrier, the barber, the butcher, the washerman, the goldsmith, the poet, and the astrologer, receive each a piece of land rent-free, and a stipend in grain or money from each villager, in return for which they are bound to perform the duties of their respective vocations; to make ploughs, build houses, dig wells, shave heads, tell tales, and cast horoscopes for the community. No system could have been devised better calculated to render mechanical arts stationary, and each little population is perfectly independent of foreigners. Competition is unknown—trades are hereditary—improvements of machinery never displace hand labour. The land is the property of the supreme government, and every head of a family has a piece of it. Almost all laws are defrayed by a tax, which is, in effect, the rent of land. In fact, the condition which certain social reformers desire to carry out in Europe, is realised, and has been realised for centuries, among the Indian villages.

Bad roads, rivers, jungles, marshes, tigers, and robbers, effectually fill up the place of custom-houses and protective duties. Agricultural improvements are useless, where surplus produce would be valueless, because it would never pay to carry it to market.

Under these circumstances, the quarter of wheat is worth from 7*s.* to 10*s.* Famines are periodical, and improvements are unknown in the interior, while on the coast ships are built, furniture is manufactured, and English goods of many kinds are executed with very great skill, of which examples have been sent.

Among the agricultural implements, we must note that the Indian plough is not ill adapted for its intended purpose. The shape is nearly the same as that of the Roman plough, and less rude than that employed by our Saxon ancestors, which was attached to the tails of their bullocks.*

The Indian plough is chiefly used for stirring up and running a furrow through moist ground, preparatory to sowing rice. It does not answer to dry up the land by turning a furrow. The mould-board of the English plough has been used in some tropical countries and abandoned. Dry land for other crops is broken up with coarse hoes, of which full-sized specimens will be found under the table on which the agricultural models are displayed. These hoes, except that they are shorter in the handle, are of the same shape as those still in use in the West Indian islands, where the plough has not been introduced. It is also the implement of the modern Egyptian peasantry.

The ploughs exhibited in the southern bay consisted of a taper piece of wood, shod with a sort of spear-head of iron, which forms the share, the sole being of wood, without either mould-board or coulter. Into the wood a handle is fixed, one or two buffaloes are harnessed, and the ploughman, naked all but a bit of cloth round his loins, holding the handle in one hand, and the reins in the other, will get over more ground than could be accomplished with an English plough, quite effectually enough for his purpose. Into the furrows the rice is dropped, and covered by one of the harrows, of which several models and one full-sized implement are shown, made with iron, and wooden teeth. These harrows are much more finished works than those often used in the bush of Australia, where wheat is harrowed in with a bough of a tree, or by running a flock of sheep over the ground.

The Hindoos generally get two crops of rice off the same ground—the first for food, the second for straw; and there is reason to believe that successive crops of this grain, which is the staple of the native population, except in the north-western province, where they live on wheat cakes, has been grown on the same fields for a thousand years. Rice-fields must either lie on the banks of rivers, flowing at a level where the soil can be fully saturated and at a proper time flooded, or artificial irrigation must be resorted to.

There are a number of hydraulic machines exhibited of the kind used for irrigation, on which so much tropical cultivation depends. It is one of the arts we have yet to learn and apply to our semi-tropical colonies. In one instance, in the north bay, six bullocks were to be seen employed in hauling a leather bucket out of a well in the same manner that we sometimes see a brewer's horse haul an empty barrel out of a cellar. It is impossible to imagine a more wasteful employment of power. In the south bay were several endless-chain buckets worked by bullocks moving a gin or horizontal wheel round. In another instance we observed the bucket to be raised by the lever principle.

We would suggest that this set of models might afford the means of a very useful and interesting lecture on the application of simple machinery to irrigation. To intending colonists, such lessons would have great value.

Our agricultural schools and colleges, which are preparing many colonists, should take up the question. The resources of the very promising colony of Natal cannot be developed without machinery for irrigation, as the principal rivers run between steep banks.

Five or six models of hoes drawn by bullocks were shown: these are used in the cane fields. It is plain that hundreds of years before Jethro Tull wrote on the sovereign merits of horse hoeing, part of his system was in practice in Central India.

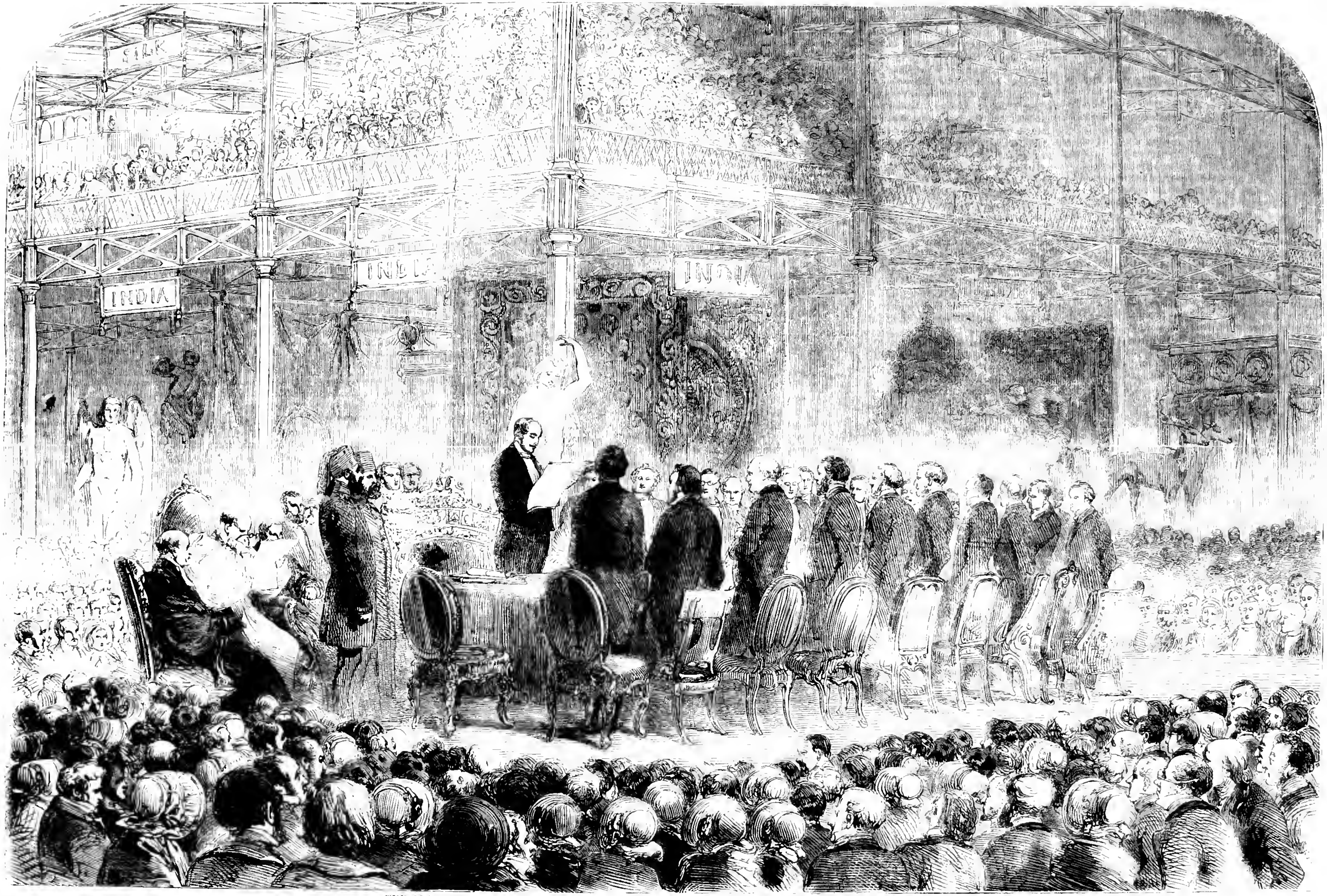
In all these implements iron is used where it can be got; and no doubt, if we succeed in bestowing railroads on the Indian peninsula, a rapid improvement in all the mechanical implements will follow the cheap conveyance to new markets which railroads will create.

The implements variously known as "scarifiers" and "extirpators," and "cultivators," which first began to attract notice in this country about forty years ago, have long been known to the Indian farmer, and are constructed very efficiently for working in light land. They consist of a set of teeth shod with iron, arranged in a heavy bar, and drawn by a bullock.

The sickles with which the grain is reaped were shown, with a model of the floor on which it was trodden out; and on the wall of the south bay hung a rope muzzle for "muzzling the ox that treads out the corn." This plan of treading out grain is not confined to the East; it is practised in Spain, in South America, and occasionally, when labour is very scarce, in Australia. The corn is winnowed by throwing it up against the wind. The next operation (that is to say, grinding) has been illustrated. Two women are squatted down opposite each other, having a pair of millstones between them, of which the upper one fits into a hollow in the lower one: a handle is fixed excentrically in the upper stone in such a manner that one of the two women is always pulling towards her. This implement is as old as the time of Job.

The last operation of Indian agricultural economy to which we will refer is the manufacture of sugar. Two grooved rollers of wood, placed face to

* The act of the Irish Parliament, forbidding, under penalty of fine and imprisonment, "a barbarous custome of ploughing, harrowing, drawing, and working with horses, mares, geldings, garrans, and colts, by the taile, whereby the breede of horses is much impaired in this kingdom," was not passed until the reign of Charles II., in 1634.



THE CLOSING OF THE GREAT EXHIBITION.—PRINCE ALBERT RECEIVING THE REPORTS OF THE JURIES, Oct. 15, 1851.

ANIMAL AND VEGETABLE PHYSIOLOGY.

ARTICLES OF FOOD.

THE three great physical wants of man are Food, Clothing, and Habitation; and of these, Food may be pronounced the most essential. Considering that, for some thousand years, successive generations have had ample opportunity of testing the values of different kinds of food, it might be supposed that, both in theory and practice, our knowledge of alimentary substances would be more complete than that of any other subject. Yet the whole question, in a philosophic point of view, requires a high amount of knowledge, and is so recondite, that, even at the present time, it is very imperfectly understood. The researches of modern chemists and philosophers have clearly indicated that the operations of external nature and the operations of the functions of man are conducted according to the same laws, and that man has only the power of discovering the principles of nature, and adapting them to his use. According to this view, organic beings, and even man himself, are mere elaborate contrivances, exhibiting the perfection of nature, but in no whit differing, in the laws under which they act, from the steam-engine, the battery, or the candle. From this cause, as organic beings are continually exhibiting force or capacity to change the arrangement of matter, it follows that, according to the universal law of nature, some other matter must be changed within their bodies, and hence, for that change, food is required. The human body falling within the class of warm-bodied animals, requires matter to be changed or to enter into new combinations for the production of its natural warmth. It requires other matter to be changed for the capacity of exercising its muscular force; and neither the slightest action of the finger, nor even the winking of the eyelid, can be exercised without a corresponding demand for food. Lastly, although the production of heat and the generation of force require the greatest amount of food, yet materials are required to build and support the frame of which the human body is made up. Not a thought can arise, nor a dreamy vision appear, nor a determination be arrived at, without a waste of material. In considering alimentary matter, we shall have to consider, in the first place, of substances required to maintain the warmth of the body, then of matters to maintain the muscular action, then of that food which is required to excite the brain: and, lastly, of other substances required to build up the structure which evinces these various properties.

Although it is manifest that we must take care to supply food adequate to these purposes, yet even the discoveries of modern chemistry do not enable us to point out precisely the manner in which every kind of food acts; and hence we must group a mass of foods together according to their composition and those effects which experience has taught us they produce. But even in estimating the value of various kinds of food by their action, instead of their composition, we are met by many difficulties; for food, to be useful, must be digested—must be assimilated or taken into the blood; and the same material which is easily digested and assimilated by one person, is absolutely poisonous to others; and there is even one case recorded of an individual in whom mutton, the most wholesome and lightest of meats, invariably, under every form of disguise, acted as a poison, and produced diarrhœa, and dysentery, &c.

The changes which take place in all organic bodies, including man himself, take place in fluid mixture. The digested food is absorbed by vessels in a fluid state and taken into the blood. The changes of the body which produce the forces occur also in materials in a state of solution; and, lastly, the excretion of the changed matter is also effected through the kidneys, skin, alimentary canal, and lungs, from fluids.

The supply of water as a diluent fluid becomes therefore a matter of great importance; and for this reason we shall first consider the contrivances by which good wholesome water can be obtained for dietary purposes. The quality of water used for food is a matter immediately and essentially affecting the health. At certain times, any contamination with putrid matter acts as a most virulent poison, and at all times is liable to produce diarrhœa. During the prevalence of cholera, the ever-memorable mortality of Albion-place in the Walworth-road was produced by a drain having effected a communication with the well. At one house every individual perished. The inhabitants of the other houses, supplied from the same tank, were also great sufferers; and thus it becomes of great importance for every person to examine the character of the water which he employs.

Chemists have discovered, that, when water freezes, the ice, in the act of solidification, squeezes out all foreign matters, so really nothing can be purer than the water from thawed ice. In London, where the water supplied is but indifferent, and the sources are contaminated with animal and other refuse, perhaps no better course can be adopted, by those who are in a position in life to afford it, than to use that solid ice which has been recently imported; for not only might it be employed to cool wine and other provisions, but, when thawed, would form an excellent beverage. All artificial contrivances for freezing water are, doubtless, not so economical in their application as the simple mode of importing it from colder climates. At the present day, ice may be made in the red-hot crucible; but the best plan, exhibited at the Crystal Palace, is that devised by Mr. Masters, and by which we have seen very beautiful blocks of ice prepared. Next to the purification of water by freezing, that by distillation demands attention. In London many persons have an apparatus which is attached to their kitchen-ranges, and which is capable of giving a considerable quantity of a bright fluid. In this case some empyreumatic oils are very apt to come over with the water, and give it an unpleasant taste.

As far as the mechanical impurities of water are concerned, they may be removed by filtration, and large quantities of dead and putrifying animal and vegetable bodies may be separated by this simple process. There can be no more simple mode of filtration than by using a piece of blotting-paper placed in a funnel; and, in fact, this mode is adopted by chemists, even for their more delicate operations. At the Exhibition many mechanical filters were shown, the majority of which are so contrived that a pressure assists the more rapid action of the water. The filters exhibited both by Mr. Stirling and Mr. Slack are said to have the power of filtering very large quantities of water.

In many cases filtration may be employed, either through animal charcoal, or that peat charcoal which has been recently found so effective to deodorise and absorb putrid material. This process is so effective, that Dr. Garrod has lately pointed out that the most deadly vegetable poison may be removed from water by animal charcoal.

In using water as a diluent some precautions must be taken, for, after great fatigue and exhaustion, a sudden draught of cold water is attended with serious consequences. Quintus Curtius records that Alexander the Great lost more men by this means than he had ever lost in any battle.

The active substances which are used for food must consist of various elementary bodies: we principally use compounds of hydrogen, carbon, nitrogen, iron, potash, soda, and phosphorus; as all of these elementary matters are the subject of changes, or enter into new combinations, which produce the forces which the human organisation manifests, and may then be detected in the changed materials which are excreted.

Of all foods, perhaps, those derived from other animals deserve our first consideration. Every surgeon knows the beneficial influence of a generous diet in developing a highly organised individual. At the London dispensaries and workhouses the baneful influence of an imperfect diet is shown by a debilitated body and feeble mind; and the railway labourer is known to require a large amount of animal food to enable him to follow his avocation. We have ascertained from many calculations, that amongst the middle classes the value of the average amount of flesh meat eaten in London amounts to about sixpence per head *per diem*, where the party is left to follow his own inclinations, without restriction or guidance. Upon this average, the butcher's bill for ten persons amounts to about 90*l.* a year. If we consider that this amount of flesh meat is the proper quantity, we perceive at once the importance of the subject under consideration. And though a small section of the population are *phytophagi*, or vegetable-eaters, such individuals form the exception, and not the rule; and to preserve the integrity and enterprise of the Anglo-Saxon race, the first medical authorities declare that a full meat diet must be used.

In the South-west Gallery various samples of milk preserved for voyages were exhibited. First of all, Moore's concentrated preserved milk comes before us, with a good appearance and excellent testimonials from various surgeons who have reported upon the subject to Sir W. Burnett. Again, we observe milk prepared by other processes. Mr. Fadeuilhe has exhibited consolidated milk, of a buttery appearance. Some preserved cream was also shown; and a single bottle of artificial milk, composed of yolk of egg and other materials, to partake as near as possible the properties of that fluid, is contributed by Mr. Presse. Milk, being designed for the growth and nutrition of the infant, contains every material for that purpose, and hence is complete in itself, at any rate for the infant state.

Butter—the fatty portion of milk separated from it—was poorly represented at the Exhibition; nevertheless, the Americans contributed several tubs of this article of food. Butter, being composed only of hydrogen and

face, are turned by two men with handspikes, while two or three sugar-canes are thrust between them: the small percentage of juice extracted by this imperfect force falls into a pan below, and is thence conveyed to open earthenware pans, which are close at hand for the purpose of boiling. And yet India sends us a good deal of sugar.

After a very cursory examination of this picture of the rural life of the Indian population, presented in this very curious set of models and figures, it is impossible to doubt, that, with the increased means of communication which roads and railroads would open, the interior of central India is capable of affording a largely-increased exportation of cotton, sugar, rice, linseed, hemp, and other staples peculiar to the soil and climate; and that the result of increased intercourse would be to greatly improve the social and intellectual condition of the native population, and to render them better customers for the manufactures, which we can produce so good and so cheap.

At present we shall not say anything respecting the set of looms exhibited for weaving cloth, shawls, and carpets (the last is on a working scale), but be content with observing that since, by the powers of our mechanical inventions, we are able to import cotton from India, manufacture it, and re-export it at such a price as to undersell by 75 per cent. the half-naked rice-eating producer of the finest muslins, it is as much our duty as our interest to assist in stimulating the growth of cotton and other agricultural produce of India.

MACHINERY AND MECHANICAL CONTRIVANCES.

FAIRBAIRN'S PATENT RIVETING MACHINE.

THIS is a machine lately invented and brought into use by the Messrs. Fairbairn, of Manchester, for riveting the seams of boilers, &c. It owes its origin, we believe, to a turn-out of the boiler-makers in the employ of the exhibitor, about fifteen years ago. The principal advantage attributed to it is that it does noiselessly, at once, and with unerring precision, by simple compression, that which was formerly done by means of repeated blows of a hammer; and that before the rivet has lost its heat, so that by its contraction in cooling it grips the plates still tighter together. This machine is capable of fixing in the firmest manner eight rivets, three-quarter inch diameter, in a minute, with the attendance of two men and two boys to the plates and rivets; whereas the average work that can be done by two riveters, with one "holder-on" and a boy, is forty similar rivets per hour—the increase in quantity of work done by the machine being at the rate of twelve to one, exclusive of the saving of one man's labour. The work, also, is done better, for reasons already stated, the boilers being more secure from leakage than under the old method.

The construction of this machine will be easily understood by those conversant with mechanical and engineering contrivances, from an inspection of the Engraving. The large upright stem is made of malleable iron. The riveting dies are of various descriptions, adapted to every description of flat or circular work; even the corners are riveted with the same care as other parts, so that vessels of any shape may be completed without recourse to the old process of hammering.

MIDDLETON'S CENTRIPETAL WHEEL PLATE.

AMONG the various improvements in carriage building exhibited, was a contrivance of the Messrs. Middleton, for lessening the draught of carriages, and shortening the lock—two important considerations, which have at different times attracted the attention of some of the first builders. It has been considered that a sliding perch bolt, as connected with the wheel plate, would certainly be better than the fixed one in ordinary use. Yet it is a matter of considerable difficulty to keep the "under carriage" always under the centre of the body, which is a serious objection, as, if the carriage is curved away from the centre, it not only makes it very difficult to lock round, but renders it liable to accident from being over-turned, owing to a want of sufficient bearing.

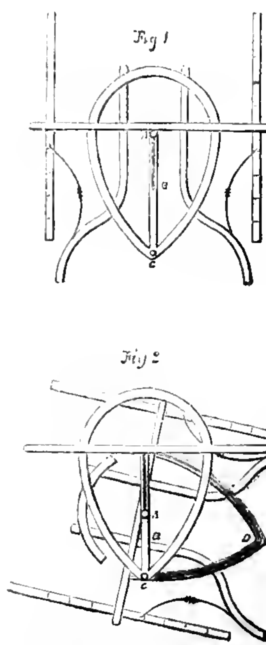
By the accompanying diagrams—1 and 2—it will be seen that the inventors have overcome the difficulties alluded to. A plan of the carriage, as it would appear when running in a straight line, is shown by Fig. 1. Thus, the wheels are brought much closer together, as the under carriage is full ten inches nearer to the centre of the body than usual.

The carriage is shown on the "full lock" by Fig. 2, when the bolt A has been moved down the full length of the groove B, being guided both smoothly and equally by means of the pin C running in the groove D of the transverse plate, thereby allowing the wheels to work under the body.

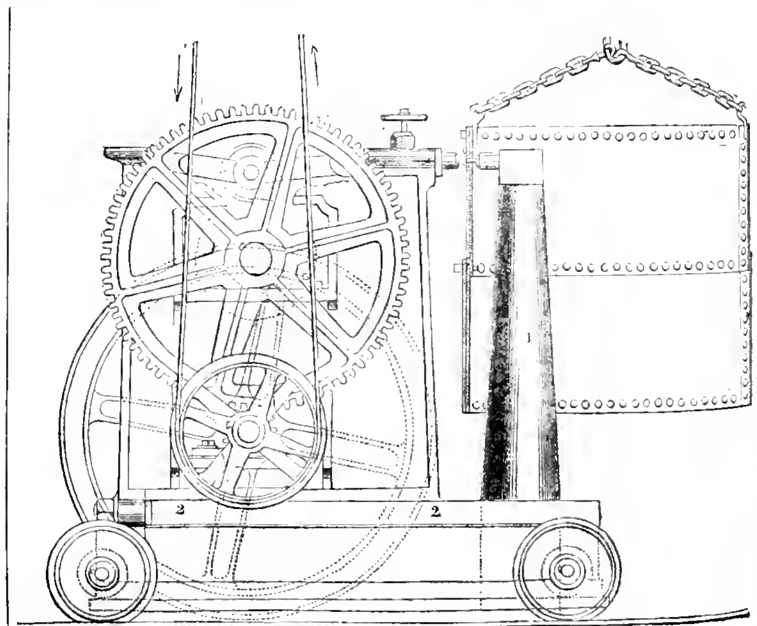
The elliptical form given to the wheel-plate is both novel and ornamental, and the whole arrangement seems calculated to ensure ease and safety.

CLOSING SCENE OF THE GREAT EXHIBITION.

THE Engraving standing across the next two pages represents the interesting and memorable ceremony of October 15th, when Prince Albert, as President of the Royal Commission, received the Reports of the Juries from Viscount Canning, and read a reply, in which, on behalf of the Royal Commission, he thanked the members of the Juries, the Foreign and Local Commissioners, and others who had exerted themselves in promoting the objects of the Great Exhibition. The proceedings took place upon a temporary platform erected on the site previously occupied by the Crystal Fountain in the middle of the transept. For further particulars, our readers are referred to No. 4, page 59.



MIDDLETON'S CENTRIPETAL WHEEL-PLATE.



FAIRBAIRN'S PATENT RIVETING MACHINE.

carbon, is insufficient of itself to maintain the vital functions. The more important constituents of milk, which are separated from it and consolidated into cheese, form a concentrated kind of food, which is so well adapted for keeping, so easy of transport, and yet withal so well calculated to indicate skill in its manufacture, that we might reasonably expect that the Crystal Palace would have been inundated with examples.

Next to milk, blood must be regarded as a material having all the constituents requisite for food. It is but little used in any country. The Levitical law so strictly forbids its use, that it orders it to be thrown upon the ground. This is carried out to the present day by the Jews, and we can but think there is some medical reason for its not being used. To our mind, there is something revolting in the use of blood, and we should be very indisposed to try the blood bread of either the ox, cow, calf, lamb, or sheep, all of which are exhibited by Mr. Bocchiere. Amongst those articles of food, and placed in the sect on for food, are specimens of the preserved blood of healthy men and healthy women, for the excellence of which, as articles of diet, not being cannibals, we can give no opinion. We have no experience of the use of blood to any extent as an article of food, and, therefore, would not recommend it even under the title of blood bon-bons, which are shown amongst these articles. Of course, in times of famine, they might possibly be of great assistance.

From the consideration of the blood foods, we now pass to the more pleasing criticism of materials derived from the muscular fibre, or meat. In this department the Americans have shown large barrels of beef and pork prepared for ship purposes. The same people have shown specimens of hams and spiced beef; and our Irish neighbours, represented by Mr. Smith, have cured a whole pig, to exhibit their skill in this department of the preparation of food. A few other hams were shown, but in this matter the display was not good. In these cases salt is used in considerable excess, and it has become a matter of great importance to prepare meat so that it will keep without that material. Napoleon offered a large reward for any person who should provide this desideratum, which we believe was first discovered and used in France. Subsequently, Mr. Cooper also succeeded in finding out how to conduct the same operation, and his discovery was rewarded by a handsome fortune produced by the sale of preserved meats for ship crews. Neither he nor his descendants have contributed specimens to the Exhibition, although Captain Parry and Captain Ross have spoken of them as being "in flavour and quality superior to every other."

The important department of prepared provisions was extremely well represented. Messrs. Gamble sent, amongst a large number of tins, one canister of boiled mutton supplied to the Arctic expedition in 1824, and found by Sir James Ross in Prince Regent's Inlet, in 1849, in a perfect state of preservation. Mr. Leonard showed beef said to keep good for any time; and a large quantity of foods from New South Wales was also exhibited. The principle of the preparation of the foods is the total exclusion of the air, and hence no putrefaction or other change occurs. It is impossible to tell to what extent this manufacture will eventually be carried, for in some parts of the world animals are kept for their skin and fat only, the meaty, or nutritious part, being useless for any purpose. We are told that the large navy contracts for these preserved meats are taken by persons who procure the materials from foreign countries, and thus are enabled to supply them at a very moderate price. If so, we see no reason why thousands of tons of such provisions should not be imported for the use of our industrial classes; for already their excellence is well known to the bachelor students of the inns of court, who keep a supply by them to use when required. This invention will, doubtless, by degrees, amply develope itself. Of course, of the relative excellence of the things exhibited we have no means of judging from simply looking at the canisters. Mr. Whitney showed beef preserved in a dry state, in fact, as a powder, without salt: doubtless, if well prepared, it might become a good breakfast viand. A more important material was exhibited by Mr. Warriner and M. Soyer. It consists of the gravy of meat, containing, probably, all its soluble matters in a concentrated form. It is procured from Australia, where the carcases of sheep are positively worthless. In the department of chemicals, Mr. Bullock has furnished a beautiful specimen of both kreatine and kreatinine, two alkaloids which Liebig has lately discovered in the flesh of animals. Perhaps we dare affirm that such specimens as these have never been produced before, and that they are the largest and finest examples that have ever been made, and, therefore, well deserving of careful study.

Madame St. Etienne has shown specimens of combinations of animal food with vegetable; so as also Mr. Gentile, apparently from the same works at Totnes; and the Americans have sent over some meat biscuits. These latter we have had an opportunity of tasting, and they appear to be a very excellent compound of flour with the gravy of meat. The whole question of the preparation of food is but in its infancy—a mere germ, which, perhaps, in future years, will be fully developed.

The flesh of meat is particularly valuable as an alimentary matter, inasmuch as it supplies the substance which enables us to evince muscular action; and, though we shall hereafter point out that some vegetables contain a similar principle, yet animal food seems, upon the whole, with due deference to the vegetable feeders, to be the best substance which can be employed for that object.

Fish is somewhat less digestible than meat. Preserved salmon and various other fish were exhibited by the same persons who have shown the preserved meats. We need hardly remind our readers that we owe isinglass to fish. This material was well represented by Mr. Simpson, who has shown an excellent case of samples of this material. By the machines it is cut up into fine ribbons, such as those which are sold in the grocers' shops. Amongst the Indian collection [illegible] and a number of "shark" fins which are also employed by them [illegible] a similar object. Of late years gelatine has been procured not only from fish but also from animal substances, and various specimens of gelatine were shown. In purchasing this substance the public must rely upon the honesty of the vender; for, although some are as good or stronger than isinglass, others are almost as bad as the better sorts of carpenter's glue. Mr. Batty has shown some beautiful glasses of calves' feet jelly, which will keep for any time, and yet preserve the flavours which have been imparted to them. In England fish does not form so common an article of diet as formerly, when indentures of apprentices made in the towns on the borders of the Severn contained stipulations as to the number of days to which the eating of salmon was to be restricted, or in those ancient periods of history when Herodotus records that there were two or three races who lived exclusively on fish, and hence were called Ichthyophagi.

In the Swiss department some dried trout, dried mutton chops, cutlets, &c., were exhibited; and in the French department various articles preserved in tins, but not deserving any special description.

The preparations of gelatine were formerly in high repute; but modern chemistry seems to indicate that they are serviceable for the tendons, fasciæ, and skin, and do not communicate to the system matter which supplies the changes which are required for muscular action; and certainly the practical surgeon knows that they are incomparably inferior to the soluble parts of muscular fibre, or flesh meat, for restoring strength and muscular energy.

Amongst preparations from fish, we must not omit the fish oils. These during the last ten years have come much into use as a medicine, though, perhaps, they must be regarded more in the light of a food than a remedial agent. By the use of the fish oils, such as cod liver oil, and the oils of a similar character, the surgeon can fatten his patient at discretion, and can even, by their agency, remove the tubercular matter which, when deposited about the joints, constitutes scrofula—when deposited in the lungs constitutes consumption. The judicious use of these oils, combined with other proper treatment, has so very much increased the duration of life in consumptive cases, that this malady is now, in a great majority of instances, cured, or stopped in its progress before it has fatally disorganised those organs so absolutely necessary to the right performance of the vital functions.

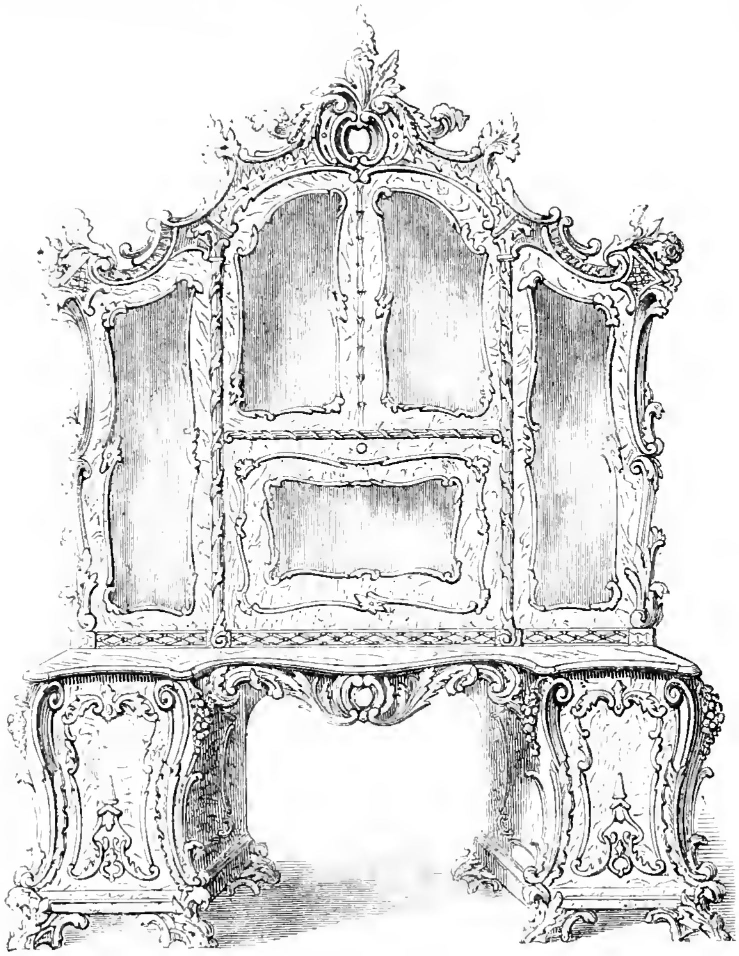
Amongst the articles of food, there were some furnished by the Chinese and Indians which we think are almost new to England—these are edible slugs. They have a most uninviting look, and are large, dried, black masses, which are eaten by Eastern nations; but with their excellence, flavour, and properties we are not acquainted. Amongst the Chinese and Indian collections, we had also such a display of edible birds' nests as we never saw before in this country. These nests, as exhibited, were in two, if not in three varieties; the first being quite white, and somewhat resembling dried white of egg; the second being mixed with feathers. These are used for soup, and, according to the analysis published by modern chemists, they contain the highest amount of nutritive ingredients: in fact, containing a highly nitrogenised substance, they must be considered as being one of the most concentrated kinds of food which can be employed. Amongst the luxuries which doubtless in time will be rendered much cheaper, is preserved turtle, and we see no reason why the delicious calipash and calipee should not be abundantly prepared in regions where these creatures abound, sealed up in tins and sold at a moderate price. It is now largely imported, but not to the extent which it deserves.

Perhaps there is no more curious feature connected with animal food than the economy which is practised with such portions as are unfit for food. The very refuse in making candles fetches comparatively a high price in the shape of greaves; and, in fact, every portion is turned to some account. Some time ago, when experimenting on various foods, the writer called at a large retail shop, and offered to purchase all the fragments of cheese which necessarily occur in cutting it. The man asked what seemed to be a preposterous price; but, whilst debating the matter, a respectable-looking female, who overheard the conversation, turned round and exclaimed, "Ah, sir, you little know the value of those fragments: if you had a family like mine, you would be glad indeed to get pieces of such good cheese for supper!" Of good food every fragment is sold; and when animal matter is unfit for food, it passes into the manufacturer's hands to be changed to other substances.

In taking a review of the animal substances used for the food of man, it will be seen, that, without there being anything positively new in the Great Exhibition, there were many materials which are but very little known, not only to the public, but even to those who have deeply studied these subjects. The most important and suggestive examples are, doubtless, those in which meat is preserved to keep for any period, and is capable of being transported to any distance. The legislator and the philanthropist must for ever regard the proper supply of the industrial classes with nutritious food as a matter of the utmost importance. Our workhouses are filled with inmates on account of bodily maladies produced by insufficient or improper food. Our hospitals and dispensaries are crowded with supplicants for aid from the same cause. For the full development of the intellectual faculties adequate nourishment was absolutely necessary: and consequently, both physically and morally, there was no subject of more importance at the Crystal Palace than those specimens of food which were exhibited, which are likely to tend to the more extensive supply of animal food to the industrial classes.

FURNITURE.

THE display of furniture in the Great Exhibition, although extremely showy and costly, and calculated to excite the wonder of the millions who beheld it at the bare thought of the value of the materials employed, and the labour bestowed upon the various articles, has, after all, done very little to promote the interests of that homely idol, "comfort." Luxury has been studied, ostentation has been courted, wealth has been propitiated, but to the many thousands who have to consult economy of space, of material, and of outlay, scarcely a suggestion has been offered for the improvement of the "style" of their homes. The poor man, therefore, has gained very little, if anything, in this respect by the Great Exhibition;—he must put up still, with the same rattle-trap, clumsily made chairs and tables as heretofore;—or resort to the broker for the cast-off finery of his richer neighbours, much of which he will find unsuitable both in dimensions and fashion for his purpose. And even the man of taste and wealth, curious in articles of *vertu*, has not found all to admire in this gaudy display. Invention, guided by reason, has not been at work; mere copying of established, not to say obsolete, models has been the rule; and the sole object of ambition with each competitor seems to have been, how much of decorative device he could crowd within a given space, without any regard to its suitableness in a utilitarian, or appropriateness in an artistic point of view. At the same time there were exceptions, many of which we shall be glad to note from time to time, when continuing these remarks; and to make a beginning we are happy to fix upon two very creditable exhibits in this line.



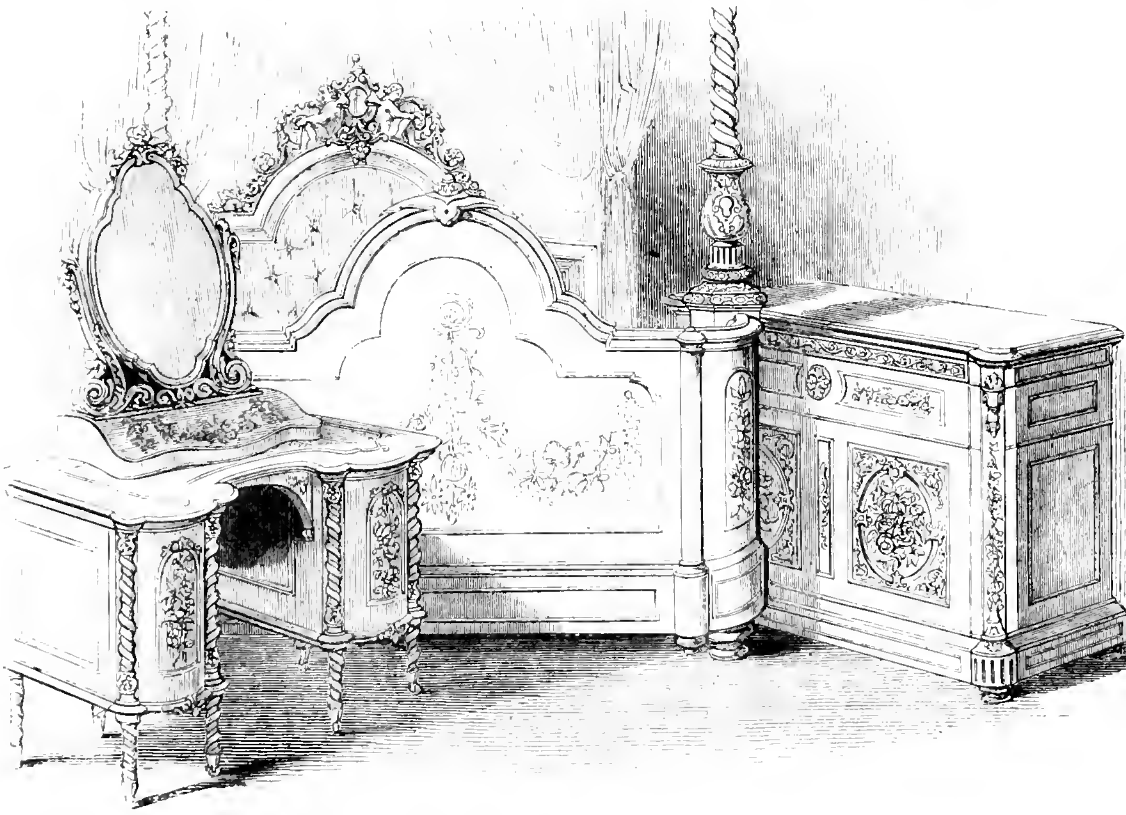
MONOCLEID CABINET. BY SOPWITH.

MONOCLEID CABINET. BY SOPWITH.

Sopwith's Monocleid Cabinet is a very serviceable and well-made piece of furniture. It is made of black walnut wood—the upper panels being of silvered plate glass, ornamented throughout with carved gilt mouldings. This cabinet contains a great number of drawers and partitions, so arranged as to be especially serviceable for the keeping of various papers sorted, and the whole of them are opened by one turn of the key, there being but a single lock and a single key-hole situate externally.

BEDROOM FURNITURE. BY TROLLOPE AND SON.

The Bed-room Set, by Trollope & Son, is in very good taste; the material is satin-wood, inlaid with various-coloured woods. The bedstead and dressing-table have turned spiral legs; and the ornamentation throughout, without offending by redundancy or undue prominence, is remarkable for its admirable finish.



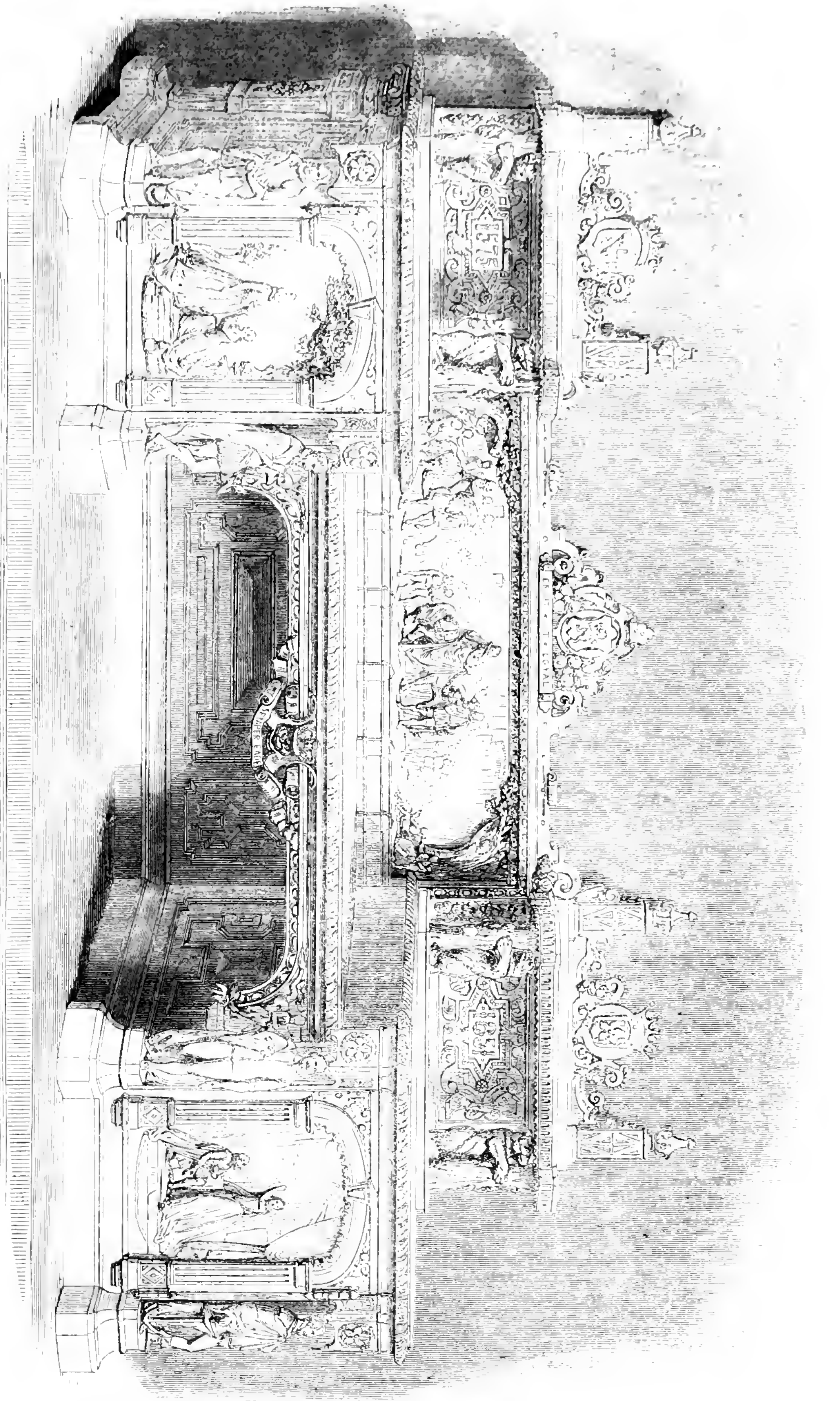
BED-ROOM FURNITURE.—BY TROLLOPE AND SON.

THE KENILWORTH BUFFET.

BY COOKES, WARWICK.

Of this very carefully studied and ambitious work, which has been one of the chief lions on the British side of the Crystal Palace, we prefer giving, in an abridged form, the description by the makers:—

The wood of which this buffet was made was obtained from a colossal oak tree, which grew near Kenilworth Castle, in Warwickshire, measuring 10 feet in diameter, and containing about 600 cubic feet of wood, which was levelled in 1842, and afterwards purchased by the exhibitors. The subject of the design is the Kenilworth Pageant of 1575, in honour of Queen Elizabeth's visit to the Earl of Leicester, described by Laneham and Gascoigne, two attendants on the Queen in this "royal progress," and vividly reproduced by Scott. The design of the centre panel, carved out of one solid block of oak, represents Queen Elizabeth entering Kenilworth Castle, in all the pomp usually displayed on these occasions. The cavalcade is seen crossing the Tilt Yard, and approaching the base court of the building by Mortimer's Tower. Leicester is bareheaded and on foot, leading the horse upon which his august mistress is seated, magnificently arrayed. The Queen (then in her 42nd year) wears her crown, and has around her neck the enormous ruff in which she is always represented. Two pages and a long train of attendants follow the Queen and her host, composed of ladies, statesmen, knights, and warriors—some on foot, others on horseback. In the distance are soldiers and a mixed multitude of people. A portion of the Castle is seen in the back-ground. At one end, the gateway through which the cavalcade is about to pass, is Mortimer's Tower, the remains of which are still in existence, and considerably heighten the romantic beauty of the Kenilworth ruins. At the opposite end of the panel, the Earl of Essex, Leicester's rival in the favour of Queen Elizabeth, is conspicuously seen, mounted on a charger. On the table part underneath the centre panel is displayed the Tudor rose, and surmounted by the royal crown, with the famous motto of Elizabeth, "Semper eadem," on a ribbon. On the spandrils, supported by water-flowers and rock-work pendentives, are marine subjects taken from the "Pageant," namely, a Triton on the Mermaid, and Arion on the Dolphin, connected with Mike Lambourne's mishap, in the novel of "Kenilworth." The panel on the right or dexter side of the buffet recalls the scene in the same work when Elizabeth meets Amy Robsart in the grotto, in the grounds of the Castle.



THE KENILWORTH BUFFET. BY COOKES, WARWICK.

The subject of the left panel of the buffet represents the interview of Queen Elizabeth and Leicester, after the exposure of the deceit practised upon her by the latter, and his marriage with Amy Robsart. Leicester is shown in a kneeling position, with one hand on his breast, and the other extends towards Elizabeth, as if appealing to her sensibility. The four statuettes at the corners are emblematical of the reign of Elizabeth. At the extreme corner of the right is Sir Philip Sydney, the nephew of the Earl of Leicester, whose character combined all the qualities of a great poet, warrior, and statesman. He died in 1586. The shape of Sir Philip's sword (which is still preserved at Penshurst) is singular, the handle being about sixteen inches long. On the opposite side of the same pedestal will be recognised Sir Walter Raleigh, who attained eminence in almost every branch of science and literature. He is arrayed in a courtier's dress, and the figure represents him in a thoughtful attitude, with a scroll and pen in his hand. Raleigh was beheaded on a charge of high treason, in 1618. On the left pedestal at the inner side of the buffet is a figure of Shakspeare, who is shown in reflective mood. The last figure is that of Sir Francis Drake, the first Englishman who circumnavigated the globe. An anchor is appropriately introduced, emblematic of his naval career; and the costume chosen is a court dress. The ragged staff mouldings of the Kenilworth buffet are imitations of the best examples in the Beauchamp Chapel, Warwick, where the Earl of Leicester was interred. The supporters to the projecting shelves also represent the proud crest of this splendid noble, the bear and ragged staff, borne by the Earls of Warwick from the most remote times. The small panels of the buffet behind the Leicester cognizance contain monograms of the date of Queen Elizabeth's visit to Kenilworth Castle, and the eventful year 1851, with the cipher of the reigning Monarch, designed to record the era of the Great Exhibition of all Nations. Around the door-panels of the Kenilworth buffet are copies of architectural details still seen on the Gate-House. The upper part, above the shelf of each pedestal of the buffet, displays the monogram of the Earl of Leicester, encircled by the insignia of the Order of the Garter, and surmounted by his coronet. The decorations on each side are specimens of Elizabethan ornaments, designed by the proprietors." An important feature in the production of this work is the introduction, by Mr. Walter Cooper, of *pointing*, the process adopted by sculptors in stone and marble, and by which greater accuracy is secured.

CLAUSSEN'S IMPROVED MODE OF TREATING FLAX.

Whether wool or Flax were first spun into threads and woven into cloth, is left doubtful by history: but the art of spinning is one of the most ancient, and one of the earliest materials spun, if not the very earliest, was Flax. The mummy cloth of Egypt, chemically and microscopically examined by Dr. Ure, was ascertained to be wholly composed, both in warp and woof, of Flax, and contained no cotton whatever. Though cotton was probably first spun in Egypt, and was certainly spun at an early period, it was much later used than Flax for the purpose of making cloth. We may indeed infer that the art of spinning must have made considerable progress before cotton was spun. No doubt, the art took its rise from platting rushes together, then went to platting the finer fibres of the Flax plant, and from platting them together to make a long thread. The downy and almost pulpy nature of cotton, keeping its filaments obscure to unaided vision, would not be likely to suggest the possibility of twisting it into a string, till that art had been learned by twisting together the long visible natural threads of Flax. Similar arguments apply to wool; and while history assures that Flax was spun long before cotton, we may infer from theory that it was also spun before wool.

After being applied to making cloth upwards of three thousand years, the same means of preparing it for this purpose having been in use for the whole time without much change, namely, rotting the plant in water, and separating by the heckle the woody and glutinous matters with which the fibres of the Flax stalk are united, an improved method of preparing Flax has lately been introduced. Many reasons, such as the unwholesomeness of the rotting process, the offensive qualities it imparted to the water, the weakening of the fibre, and the discoloration of the Flax, induced people years ago to turn their attention to the subject; and, though several patents were taken out, it remained to our time to effect any considerable improvement in the process. Latterly, the failure for two successive years of the cotton crop in the United States, the large increase of our cotton manufacture, and the repugnance felt by some persons to have so much of the national prosperity dependent on the product of slave labour, has sharpened the wit of inventors, and Chevalier Claussen, a Belgian, has recently brought before the public a scheme by which Flax, the product of our temperate climate, for the growth of which Ireland and a large part of England are peculiarly well adapted, may be made to a considerable extent to supply the place of cotton. On the great advantages of extending the cultivation of Flax; of the immense quantity of very fattening food it supplies for cattle; of the healthy employment it gives both out of doors and in doors, we need not speak at present. We shall now only describe the additional advantages likely to accrue both to agriculturists and manufacturers from Claussen's improved method of preparing the Flax for being spun after it has left the hands of the agriculturists.

From the nature of Flax, considerable difficulty is experienced in spinning it by machinery, and the greater facility with which cotton can be spun in this way is the principal reason why cotton cloth has come so extensively into use, and has in many cases superseded linen. Its peculiar properties, however, must always make it acceptable, particularly in warm climates, to a great multitude of people. The problem to be solved in this case was to make Flax as easy to spin by machinery as cotton, and to adapt it to the machinery already in use for spinning. It has been ascertained by microscopic observations that the fibre of Flax is of a cylindrical form, while that of cotton is flat like a ribbon, a little thickened at either edge. It is also shorter than the fibre of Flax. The process, therefore, mainly consists in converting the cylindrical and tubular fibres of Flax into flat ribbons, without destroying their texture. To cleanse the Flax thoroughly, it is first boiled for about three hours in water containing one-half per cent. of common soda. It is then placed in water containing about a 500th part of sulphuric acid; and this destructive agent being neutralised by the soda remaining in the Flax, merely cleanses the fibre, without injuring it. The process is equally useful whether the Flax be spun by the ordinary processes into linen yarn or be converted into cotton-flax. It requires much less time than the old plan of cleaning, does not impart a bad colour to the Flax, and lessens by one-half the labour required to scutch it. To convert it into cotton-flax, it is cut by a machine into suitable lengths, and is saturated in a solution of bicarbonate of soda (common baking soda). The solution penetrates into every part of the small tubes; and when that is effected, they are immersed in a solution of sulphuric acid, in the proportion of about one part to 200 parts of water. The acid combines with the soda of the bicarbonate, and liberates the carbonic acid in the form of gas, which, by its explosive force, bursts the Flax tubes, and reduces them to the flat ribbon shape of the cotton fibre. The process is so gentle, yet decisive and rapid, that it has been compared to magic. It is an extremely beautiful application of the power of explosion, as we see it bubbling and forcing its way through soda water. "The Flax fibre," says Mr. Hudson, the Secretary to the Royal Agricultural Society, who reports the experiment, "soaked in the solution of the bicarbonate of soda, was no sooner immersed in the vessel containing the acidulated water, than its character became at once changed from that of a damp, rigid aggregation of Flax, to a light, expansive mass of cottony texture, increasing in size like leavening dough or an expanding sponge." The mass, now become of the consistence of cotton, soft and silky, can be bleached either in the ordinary method, or by being placed in hypochlorite of magnesia; it may be carded in the same manner as cotton, and is as fit for spinning. In this condition, it has already been spun on cotton machinery—as an experiment, but with great success—by the Messrs. Bright, at Rochdale; and there is every reason to believe that it may be used, if necessary, as a complete substitute for cotton.

M. Claussen has been awarded a common prize medal for this important improvement—an honour, however, which he repudiates in the following protest:—"Upon an examination of the awards made by the juries appointed by you under the authority of the Royal Commission, for the purpose of securing an impartial distribution of rewards to exhibitors in connection with the Great Exhibition of the Industry of all Nations, I find that what is termed a 'prize,' or second class medal only, has been awarded to me by the jury in Class IV., in which I exhibited my new process of preparing flax, so as to adapt it for spinning or weaving, either upon the ordinary flax machinery or alone, or in combination with cotton and wool upon the existing cotton and woollen machinery. As I consider this award to be totally at variance with the spirit and letter of the instructions given by your lordships to the Council of Chairmen of the Juries, I beg most respectfully to decline to receive the medal so awarded."

THE SMOKE NUISANCE.

The public may not be aware of a clause of very considerable importance which was introduced into the City of London Sewers Amendment Act, of the past session; and which comes into operation on January 1, 1852, viz:—

"That from and after the First Day of January One thousand eight hundred and fifty-two every Furnace employed or to be employed in the working of Engines, by Steam, and every Furnace employed or to be employed in any Mill, Factory, Printing House, Dyehouse, Iron Foundry, Glasshouse, Distillery, Brewhouse, Bakehouse, Gasworks, Waterworks, or other Buildings used for the Purpose of Trade, or Manufacture, within the City (although a Steam Engine be not used or employed therein), shall in all Cases be constructed or altered so as to consume the Smoke arising from such Furnace; and if any Person shall, after the First Day of January One thousand eight hundred and fifty-two, use any such Furnace which shall not be constructed so as to consume or burn its own Smoke, or shall so negligently use any such Furnace as that the Smoke arising therefrom shall not be effectually consumed or burnt, or shall carry on any Trade or Business which shall occasion any noxious or offensive Effluvia, or otherwise annoy the Neighbourhood or Inhabitants, without using, to the Satisfaction of the Commissioners, the best practicable Means for preventing or counteracting such Annoyance, every Person so offending shall forfeit and pay a Sum of not more than Five Pounds nor less than Forty Shillings, for and in respect of every Day during which or any Part of which such Furnace or Annoyance shall be so used or continued."

MEMOIRS OF WORKING MEN.

UNDER the above head we intend from time to time giving brief memoirs of "working men," who, by their well-directed industry and ingenuity, have distinguished themselves above their fellows, and contributed new or improved principles of importance to the manufacturing resources of the world. Such a series of sketches we consider to be strictly in accordance with the spirit in which the Great Exhibition was founded, whose varied wonders were not the work of a day, nor an age, but the fruit of the accumulated labours and discoveries of a century and more of such men as Watt, Arkwright, Hargreaves, Dalton, Peel, Wedgewood, &c. These notices, therefore, whilst they will be interesting as illustrative of the progress of Art-culture, will also serve as an encouraging incitement to thousands of "working men" of our own day, any one of whom may possibly have it in his power to add his mite to the general store of valuable experiences, and to receive his reward in fame and fortune for himself and his descendants.

JACOB PERKINS.

JACOB PERKINS was descended from one of the oldest families of that ancient portion of the state of Massachusetts, the county of Essex—a region of stubborn soil, but rich in its production of *men*. Matthew Perkins his father, was a native of Ipswich, and his ancestor was one of the first settlers of that town. Matthew Perkins removed to Newburyport early in life, and here Jacob Perkins was born, July 9th, 1766. He received such education as the common schools of that day furnished, and nothing more. What they were in 1770 may be guessed. At the age of twelve he was put apprentice to a goldsmith of Newburyport, of the name of Davis. His master died three years afterwards; and Perkins, at fifteen, was left with the management of the business. This was the age of gold beads, which our grandmothers still hold in fond remembrance—and who wonders? The young goldsmith gained great reputation for the skill and honesty with which he transformed the old Portuguese *joes*, then in circulation, into these showy ornaments for the female bosom. Shoe-buckles were another article in great vogue; and Perkins, whose inventive powers had begun to expand during his apprenticeship, turned his attention to the manufacturing of them. He discovered a new method of plating, by which he could undersell the imported buckles. This was a profitable branch of business, till the revolutions of fashion drove shoe-buckles out of the market. Nothing could be done with strings, and Perkins put his head work upon other matters. Machinery of all sorts was then in a very rude state, and a clever artisan was scarcely to be found. It was regarded as a great achievement to effect a rude copy of some imported machine. Under the old confederation, the state of Massachusetts established a mint for striking copper coin; but it was not so easy to find a mechanic equal to the task of making a die. Perkins was but twenty-one years of age when he was employed by the Government for this purpose; and the old Massachusetts cents, stamped with the Indian and the Eagle, now to be seen only in collections of curiosities, are the work of his skill. He next displayed his ingenuity in nail machinery, and at the age of twenty-four invented a machine which cut and headed nails at one operation. This was first put in operation at Newburyport, and afterwards at Amesbury, on the Merrimac, where the manufacture of nails has been carried on for more than half a century. Perkins would have realised a great fortune from this invention, had his knowledge of the world and the tricks of trade been in any way equal to his mechanical skill. Others, however, made a great gain from his loss; and he turned his attention to various other branches of the mechanic arts, in several of which he made essential improvements, as fire-engines, hydraulic machines, &c. One of the most important of his inventions was in the engraving of bank bills. Forty years ago, counterfeiting was carried on with an audacity and a success which would seem incredible at the present time. The ease with which the clumsy engravings of the bank bills of the day were imitated, was a temptation to every knave who could scratch copper; and counterfeits flooded the country, to the serious detriment of trade. Perkins invented the stereotype check-plate, which no art of counterfeiting could match; and a security was thus given to bank paper which it had never before known. There was hardly any mechanical science in which Perkins did not exercise his inquiring and inventive spirit. The town of Newburyport enjoyed the benefit of his skill in every way in which he could contribute to the public welfare or amusement. During the war of 1812, his ingenuity was employed in constructing machinery for boring out old honeycombed cannon, and in perfecting the science of gunnery. He was a skilful pyrotechnist, and the Newburyport fireworks of that day were thought to be unrivalled in the United States. The boys, we remember, looked up to him as a second Faust or Cornelius Agrippa; and the writer of this article has not forgotten the delight and amazement with which he learned from Jacob Perkins the mystery of compounding serpents and rockets. About this time a person named Redheffer made pretensions to a discovery of the perpetual motion. He was traversing the United States with a machine exhibiting his discovery. Certain weights moved the wheels, and when they had run down, certain other weights restored the first. The experiment seemed perfect, for the machine continued to move without cessation; and Redheffer was trumpeted to the world as the man who had solved the great problem. Perkins gave the machine an examination, and his knowledge of the powers of mechanism enabled him to perceive at once that the visible appliances were inadequate to the results. He saw that a hidden power existed somewhere, and his skilful calculations detected the corner of the machine from which it proceeded. "Pass a saw through that post," said he, "and your perpetual motion will stop." The impostor refused to put his machine to such a test; and for a sufficient reason. It was afterwards discovered that a cord passed through this post into the cellar, where an individual was stationed to restore the weights at every revolution. The studies, labours, and ingenuity of Perkins were employed on so great a variety of subjects that the task of specifying and describing them must be left to one fully acquainted with the history of the mechanic arts in the United States. He discovered a method of softening and hardening steel at pleasure, by which the process of engraving on that metal was facilitated in a most essential degree. He instituted a series of experiments, by which he demonstrated the compressibility of water, a problem which for centuries had baffled the ingenuity of natural philosophers. In connexion with this discovery, Perkins also invented the bathometer, an instrument for measuring the depth of the sea by the pressure of the water; and the pleometer, to measure a ship's rate of sailing. Perkins continued to reside in his birth-place till 1816, when he removed from Newburyport to Boston, and subsequently to Philadelphia. His attention was now occupied by steam machinery which was beginning to acquire importance in the United States. His researches led to the invention of a new method of generating steam, by suddenly letting a small quantity of water into a heated vessel. After a short residence in Philadelphia, he removed to London, where his experiments with high-pressure steam, and other exhibitions which he gave of his inventive powers, at once brought him into general notice. His uncommon mechanical genius was highly appreciated; and his steam gun was for some time the wonder of the British metropolis. This gun he invented in the United States, and took out a patent for it in 1810. It attracted the notice of the British Government in 1823, and Perkins made experiments with it before the Duke of Wellington and a numerous party of officers. At a distance of thirty-five yards he shattered iron targets to pieces, and sent his balls through eleven planks, one inch thick each, and placed an inch apart from one another. This gun was a very ingenious piece of workmanship, and could discharge about one thousand balls per minute. Perkins continued in London during the remainder of his life. He never became rich. He lacked one quality to secure success in the world—financial thrift. Everybody but himself profited by his inventions. He was, in fact, too much in love with the excitement of the chase to look very strongly at the pecuniary value of the game.

LACE.

THIS beautiful branch of manufacture was very extensively and creditably represented in the Great Exhibition, both by British and Foreign producers. We shall give several samples of the more striking patterns from time to time. Meantime, a few words upon the history of this art may not be unacceptable.

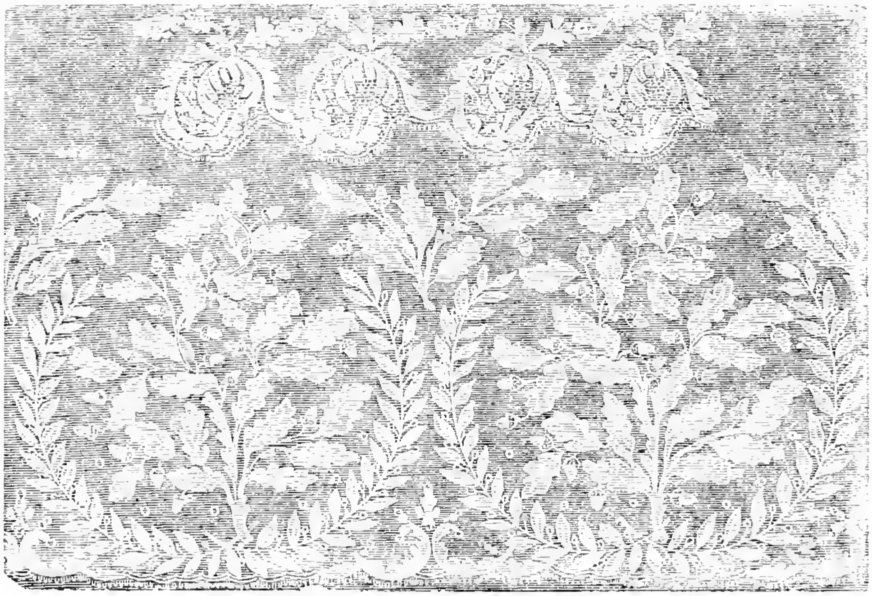
Lace is a species of net-work, made of silk, thread, or cotton, upon which, in old times, patterns were embroidered with the needle, after the constructions of the fabric. The patterns are now generally formed during the knitting itself.

The invention of lace knitting, as distinguished from lace embroidery, is attributed by Beckmann to Barbara, wife of Christopher Uttman, of St. Annaburg, in 1561, and was followed by the wives and daughters of the miners, whose business was then not so productive as usual. It may be however, that she introduced the manufacture rather than invented it. Point lace, being that worked by the needle, is of far older date. It is found abundantly in church furniture of great antiquity, and is supposed to have been originally made in Italy, particularly at Genoa and Venice.

In the lace knit by the hand, sometimes called cushion or pillow lace, as many threads are employed as the pattern and breadth require. These are wound upon the requisite number of bobbins (made of bone, whence the name sometimes given of *bone lace*), which are thrown over and under each other in various ways, so that they entwine round pins stuck in the holes of the pattern (a stiff parchment stitched on a cushion or pillow) and by these means produce the openings which give the desired figure. The best laces are made at Brussels, Mechlin, Antwerp, Ghent, Lisle, Alençon, and Valenciennes, abroad, and in Devonshire, Buckinghamshire, and sur-

rounding counties, in this country. The former is known as Honiton, the latter as Buckinghamshire lace.

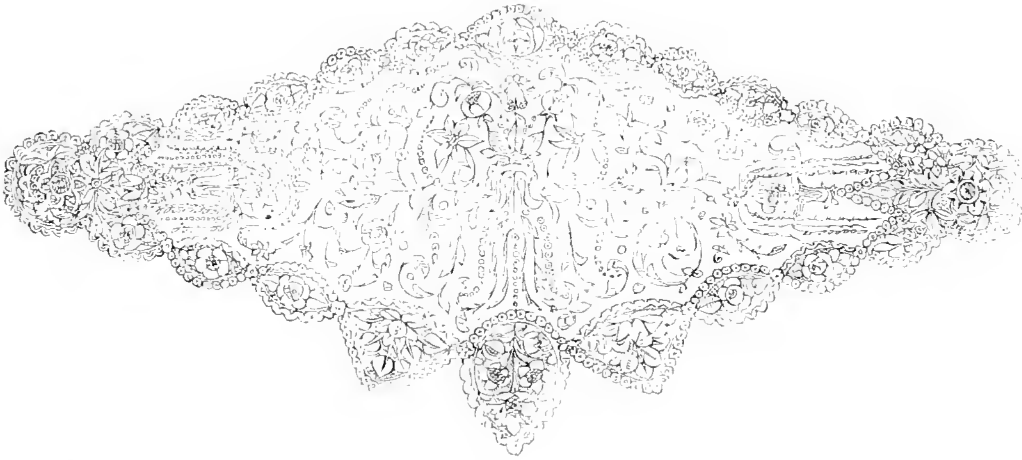
The peculiarities of some of the various kinds of lace may be worth mentioning here. *Brussels Point* has a net work made with the bobbins, and a pattern of sprigs worked in the middle. *Brussels ground* has a six-sided mesh formed by twisting four flaxen threads to a perpendicular line of mesh. *Brussels wire ground* is of silk, the meshes being partly straight and partly arched, the pattern being wrought separately with the needle. *Mechlin lace* has a six sided mesh formed of three flax threads twisted and plaited to a perpendicular line, the pattern being worked in the net. *Lisle lace* has a diamond-shaped mesh formed of two threads plaited to a perpendicular line. *Alençon lace* has a six-sided mesh of two threads. *Alençon point* is formed of two threads to a perpendicular line, with octagonal and square meshes alternately. *Honiton lace* is distinguished by the beauty of the devices worked with the needle. *Buckinghamshire lace* is mostly of a commoner description, and somewhat resembles that of Alençon.



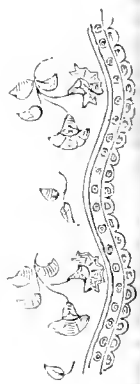
ENGLISH PILLOW LACE. BY B. HILL, OLNEY, BUCKS.

Mr. B. Hill, of Olney exhibited several specimens of Buckinghamshire pillow-lace, of very pleasing patterns, and all admirably executed. Ladies who cheapen a collar or a piece of edging little know the amount of labour required in lace making, and still less the wretched poverty of lace-makers. In the agricultural districts of Bedford, Buckingham, and Northamptonshire, there are upwards of 30,000 people (women and children) employed in making lace. The average weekly earnings of women is not more than 2s., while that of children is about 8*d*. In the production of the specimen engraved, comprising an oak-branch with pendent acorns, encircled with laurel leaves, there are upwards of 700 "bobbins" employed, and the number of stitches in a yard is considerably more than a million. It would take a lace maker, working twelve hours per day, five weeks to make a single yard.

BRUSSELS LACE.
BY A. DUCPETIAUX AND SONS.

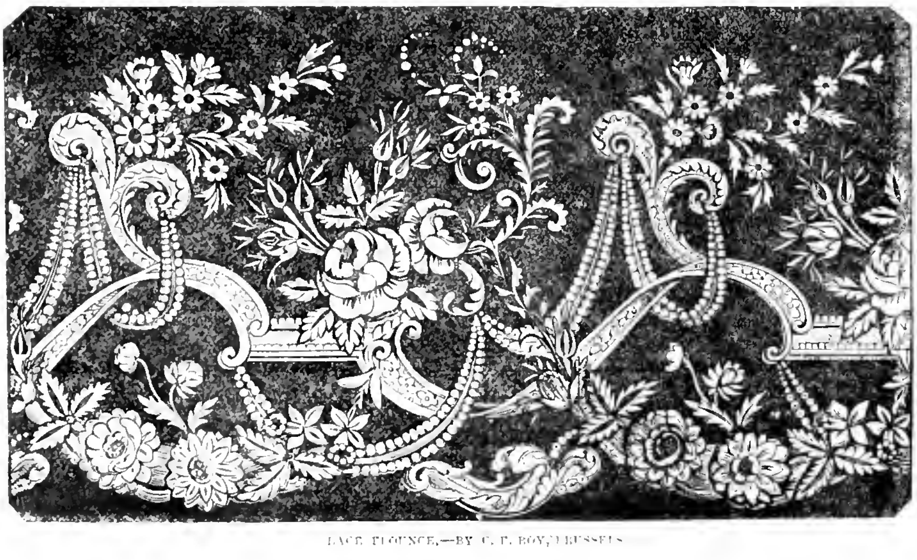


LACE.—BY I. ROBYT, BRUSSELS.



BRUSSELS LACE.
BY DUHAYON AND SONS.

A good notion of the process of lace-making was afforded by a lace pillow exhibited by Messrs. Groucock and Co., which was placed on one of the bridges in Class XIX., and which deservedly attracted much observation, on account of its singular appearance and the exceeding fineness of the lace in process of making upon it.



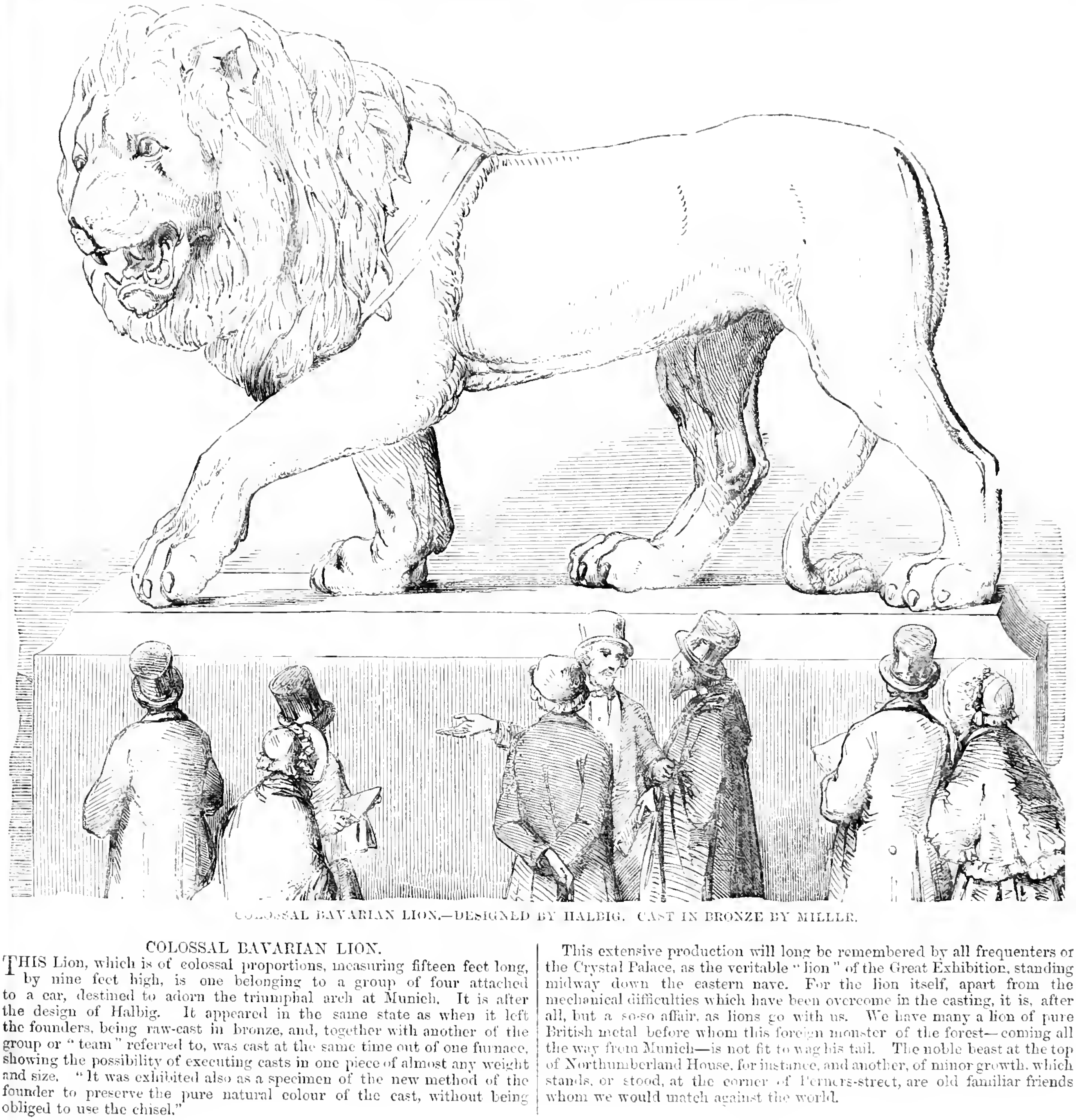
LACE FLOUNCE.—BY C. F. ROY, BRUSSELS.

The specimens of Brussels lace, which we give upon this page, are of a varied character, exhibiting the resource of the manufacture from the simplest edging to the boldest lace flowering. The last named is extremely effective in the original.

Lace made by machinery, which is sometimes called British lace, and of which Nottinghamshire is the chief seat, is a different branch of manufacture, and will demand notice under a distinct head.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.



COLOSSAL BAVARIAN LION.—DESIGNED BY HALBIG. CAST IN BRONZE BY MILLER.

COLOSSAL BAVARIAN LION.

THIS Lion, which is of colossal proportions, measuring fifteen feet long, by nine feet high, is one belonging to a group of four attached to a car, destined to adorn the triumphal arch at Munich. It is after the design of Halbig. It appeared in the same state as when it left the founders, being raw-cast in bronze, and, together with another of the group or "team" referred to, was cast at the same time out of one furnace, showing the possibility of executing casts in one piece of almost any weight and size. "It was exhibited also as a specimen of the new method of the founder to preserve the pure natural colour of the cast, without being obliged to use the chisel."

This extensive production will long be remembered by all frequenters of the Crystal Palace, as the veritable "lion" of the Great Exhibition, standing midway down the eastern nave. For the lion itself, apart from the mechanical difficulties which have been overcome in the casting, it is, after all, but a so-so affair, as lions go with us. We have many a lion of pure British metal before whom this foreign monster of the forest—coming all the way from Munich—is not fit to wag his tail. The noble beast at the top of Northumberland House, for instance, and another, of minor growth, which stands, or stood, at the corner of Berners-street, are old familiar friends whom we would match against the world.

No. 8, November 22, 1851.

Price One Penny.

HARDWARE.

PINS.

THE space devoted to the exhibition of articles of Hardware was of course occupied by an exceedingly miscellaneous collection. Its extreme limits, as regards the size of the commodities exhibited, ranged from the smallest ribbon-pin or needle to the huge anchors which were placed at the western end of the building; while the varied uses to which the articles may be applied include every conceivable purpose, from the commonest implements of domestic utility to the splendid cannon displayed by the Low Moor Iron-works. There was scarcely an article exhibited, however, which, if followed out in its process of manufacture and its consumption, would not present results perfectly astonishing to all who had not devoted an attentive consideration to the subject; and not the least interesting and curious would be those obtained from the manufacture of Pins, to which we intend more particularly to refer in our present notice.

The number of exhibitors of pins was very limited. In the Birmingham compartment there were but two, Messrs. Edelston and Williams, and Mr. Goodman—Messrs. Kirby, Beard, and Co. exhibiting in the north transept gallery; and it is a matter of regret that in the machinery department none of the mechanism by which pins are made was exhibited. After examining the finish and form of the pins in the collection of Messrs. Edelston and Williams, we cannot avoid being struck with the immense advance which must have been made since the time of Queen Elizabeth, when wooden skewers formed an indispensable adjunct to her Majesty's toilet-table. Even during the last twenty years the improvements have been very considerable. Previously to that time the head of the pin consisted of a spiral ring of wire, placed upon the shank or shaft of the pin, and fastened to it by blows of the hammer. The inconvenience which resulted from the heads becoming loose led to the adoption of a plan, now very general, for making pins with solid heads.

Messrs. Edelston and Co. exhibited a series of examples, showing the various processes which a pin undergoes in its progress towards completion. We first saw a small block of copper and one of spelter; next to these there was a block of brass, formed of the union of those two metals. The blocks were then shown cut into smaller flat strips—then partially drawn—and finally drawn out into different thicknesses of wire. The wire was next seen cut into the required lengths, in the form of "pin blanks"—afterwards "pointed" and "headed"—and finally, the silvered or finished pin. A pair of dies and a punch, used in forming the head of the pin, were also shown. By means of this instrument or machine the pin is formed, complete with the head and shaft, out of one solid piece of wire, instead of by the old process of the wire heads. The solid headed pin was invented by Messrs. Taylor and Co. about twenty years since, and was patented by them, but the patent has now expired. In order to produce the head, the shaft of the pin is cut a trifle longer than the finished pin is required to be made. The wire thus cut passes into a mould of the exact length of the pin, and the end of the wire projecting beyond the length of the mould is by a sharp blow flattened, and shaped into the form required for the head. The heads are afterwards burnished, an operation which adds greatly to their finished appearance. The finished pins we observed were most tastefully arranged around a centre, being of all sizes, from the large blanket pin, of three inches in length, to the smallest ribbon pin used by the ribbon manufacturers, of which 300 000 weigh only one pound. The collection of insect pins used by entomologists was worthy of attention, as showing what minute specimens may be produced by the aid of machinery. They are made of much finer wire than the ordinary pin, and vary in length from 2 to 3 inches to a size considerably smaller than the tiny ribbon pin. Some smooth black hair pins, highly approved of by the fair sex, and of which some tons weight are annually made by Messrs. Edelston, were also shown in their case. The smoothness of the wire, and its fineness and elasticity, are certainly most surprising.

In connection with the manufacture of the solid headed pins it is a curious fact, that although so vastly superior to the old fashioned pin, they are produced at a considerably less price, in consequence of the great perfection of the machinery employed. In addition to the improvements made in the heads, machines have recently been constructed by the firm, one of which is capable of pointing pins at the rate of upwards of six hundred per minute. These and various other improvements in the process of manufacture enable the makers to sell the great majority of the pins at the merest trifle over and above the cost of the raw metal—a large number of the pins manufactured being sold at not more than two pence per [illegible] the cost of the metal of which they are formed. Upwards of [illegible] are constantly employed by Messrs. Edelston in this branch of [illegible]; and the number of pins made by them is, in consequence of the improved machinery, more than three times that which could be made by the same number of workmen only a few years since. Upwards of 150 tons weight of copper and spelter are annually worked up at present by this one Birmingham house alone.

Were the whole of the metal which is worked up during the year in this [illegible] converted into ribbon pins, half an inch in length, it [illegible] the enormous number of 100,000,000,000, or about one [illegible] inhabitant of the globe. If placed in a straight line, they [illegible] 787,500 miles in length, or sufficient to extend upwards of thirty [times round] the globe, or more than three times the distance of the moon from the earth. Some idea may be formed from these figures, not only of the extraordinary malleability of the metal, but of the astonishing consumption of the articles formed from it. Indeed, we can scarcely conceive any question more completely unanswerable than that of—"What becomes of all the pins made?"

Messrs. Kirby, Beard, and Co. made an interesting display of pins in their stand; the back of which was ornamented with the words "Peace and Industry," and with various other decorations produced in steel beads, closely imitating the heads of pins. In the case itself were shown the pins in various stages of progress, and a large assortment of "toilet," "hatters'," "jet," "ribbon," and "milliners'" pins.

Mr. Goodman, of Birmingham, and Mr. Chambers and Mr. James, of Redditch, also exhibited a variety of pins, which, so far as we were enabled to judge of them in the case, are well-finished specimens. In the Machinery department was shown an ingenious and interesting machine, by Mr. Iles of Bardesley Works, Birmingham, used for sticking pins in circular tablets. We may add that Messrs. Edelston and Co. have recently constructed a machine, by which they are enabled to stick the pins upon the papers upon which they are sold, and which performs its work with marvellous rapidity and accuracy.

M. Reineker, of Cologne, in the Zollverein division, showed several varieties of pins—some with composition metal heads, cast in the same mode as shot, with a hole in the centre, and secured to the shaft. Samples of iron wire in hanks with a coating of copper, were also shown in the neighbourhood of the finished article. The pin manufacture of Austria was represented by M. Struntz, of Vienna; and M. Vantillard, of Méronvel, France, showed some specimens of iron pins, tinned by a process recently patented both in France and England.

ARCHITECTURAL AND ENGINEERING DEPARTMENT.

LIGHTHOUSES AND LIGHTHOUSE OPTICAL APPARATUS.

LIGHTHOUSES for the purpose of warning and guiding mariners in their course were in use with the ancients. The towers of Sestos and Abydos, the Colossus of Rhodes, and the well-known tower on the Island of Pharos, off Alexandria, are examples. Of these the last was the most celebrated, and was erected about 280 years before Christ, in the reign of Ptolomeus Philadelphus; and it was from this building, or rather from the island upon which it stood, that lighthouses have in many countries, in France for instance, received their generic name of Pharos.

In the Main Avenue West of the Great Exhibition were two specimens of lighthouse apparatus (No. 84)—the larger one being on the cata-dioptric system of the first class of lights (near the astronomical telescope); the other a dioptric apparatus of the fourth class of lights. Several excellent models of lighthouses were also to be found in the central North Gallery (No. 51), in which the apparatus of each of these classes might have been more narrowly inspected; and a variety of models, both of towers and lanterns, in the North Gallery.

One of the principal lighthouses of modern times, and certainly one of the most magnificent edifices of the kind ever built or ever designed, is the Tour de Corduan, at the mouth of the river Garonne. It was commenced in the year 1584, and occupied twenty-six years in building. We scarcely need say that difficulties in most cases occur in the erection of light-houses to which no other structures are liable. The building of the Eddystone Lighthouse is a remarkable instance of this. The number of dreadful vicissitudes it encountered are as painful to contemplate, as the courage and perseverance that finally overcame them are worthy of admiration. It was originally first built of massive beams of timber, and a light was first exhibited in 1698. The architect and engineer by whom it was designed was Mr. Winstanley. But the sea frequently rose so high around it as to dash over the light—in fact, it was said, at times, that the lantern was buried under water. Mr. Winstanley thereupon raised the tower from 60 feet to 120. The space of rock for the foundation being but small, and the situation most frightfully exposed, this was, of course, a work of stupendous difficulty. By some it was thought that he had now carried it too high for safety. They were, unfortunately, very right in their apprehensions. Not long after its completion, considerable repairs were necessary, and Mr. Winstanley went there in person, accompanied by his workmen. The repairs occupied some time; and one night a terrific storm arose, tore down the lantern and the upper part of the tower, and finally carried the whole edifice away, with poor Winstanley and all his workmen, every one of whom perished; indeed, we believe their remains were never found, nor a single wreck of the once proud structure.

Very soon after the destruction of this lighthouse, the *Winchelsea* man-of-war was wrecked on the Eddystone rocks, and her crew were lost. As it was now seen that a new lighthouse must, by some means or other, be erected here, another tower of timber was designed by Mr. John Rudyard, of London; it was finished in 1708. Its height was 92 feet. The construction was admirable for its strength and tenacity, so that it remained standing during forty-seven years. But another and more un-looked-for misfortune awaited it. Everything had been devised to protect it from the fury of the waters; nobody had ever dreamt of danger from fire in such a situation, so surrounded by the natural antagonist of this element.

By some accident, however, it took fire, and, being entirely of wood, it burned down to the very water's edge. This was in 1755.

English perseverance was again called into requisition: a lighthouse must be erected on this spot: this was determined: and in 1756 Smeaton first landed on the rock, and commenced operations by cutting the surface into regular horizontal trenches, and into them a foundation of stone was carefully fitted. It was now resolved (they had had enough of wood) to build the whole edifice of stone. The first twelve feet of the tower, as we learn from Mr. Alan Stevenson, form a solid mass of masonry; and the stones of which it is composed are united by means of stone joggles, dovetailed joints, and oaken tree-nails. An arched form was adopted for the floors of the building, with a view to greater strength; but to counteract the outward thrust of floors of this form, circular grooves were cut in the stone of the outer casing, into which a belt of iron chain was laid, and made compact with the stone by filling up the intervals with melted lead. The structure was completed in 1759, and the light was first exhibited in October of that year. The state, however, of lighthouse optics at this time in England was so low that all the illumination obtained was derived solely from tallow candles. Nearly fifty years elapsed with this wretched light before argand burners were adopted, though this great improvement was well-known during upwards of twenty years of that period.

One of the most dangerous reefs in Scotland is the Bell Rock, and so many wrecks occurred there, that in former times the good abbots of Aberbrothwick caused a float to be fixed upon the rock with a bell at the top of it, which instantly tolled as the waves swung the float about, and thus warned mariners of their danger. The circumstance, however, which led to the erection of a light-house on this rock was the loss of the *York* man-of-war. Merchant-vessels in numbers had been wrecked, and all their crews had perished, which was regarded as a sad casualty incidental to nautical life; but when a seventy-four gun ship was lost, with all hands on board, then the Government considered it was high time to take the matter practically in hand. Nevertheless, it was not till some years afterwards that a Bill in Parliament was obtained for the erection of a lighthouse. This was finally carried into effect by Mr. Robert Stevenson, engineer; not, however, without great difficulties and delays, owing to the short time it was possible to work each day between the ebbing and flowing of the tide, and not without one very narrow escape of being lost, together with thirty workmen, in consequence of the vessel that attended them breaking adrift and the tide rising upon the rock before any boat could be got out to them. The boat only arrived just in time to rescue them all from a watery grave.

The lighthouse on the Bell Rock, of which a model was exhibited, is 100 feet high. The door is 30 feet from the base, and the ascent to it is by means of a massive ladder of bronze. The light is revolving, and presents alternately a red light and a white light. It is produced by the revolution of a frame containing sixteen argand lamps, placed on the *foci* of large mirrors. The machinery which moves the whole in a circle is also applied to the tolling of two large bells; so that the original design of the worthy abbots is now carried out in the most regular and scientific manner. The cost of the erection of the Bell Rock lighthouse was 61,331*l.* 9*s.* 2*d.*

Our readers will no doubt be aware that the optical construction of these lights is of the most scientific and complicated kind; and this impression would have been by no means lessened, but probably increased, by an examination of the two specimens of glass lighthouse apparatus in the Main Avenue of the ground floor of the Great Exhibition. In each of these might have been observed the extraordinary results of the practical application of abstract science. The complicated cutting and arrangement of the lenses is all determined by the most subtle calculations of the law of reflection and refraction of light, as proved by unnumbered experiments, and the experience of many years of unremitting attention and labour. It is also worthy of note, that we have hitherto been dependent on foreign countries for very much of the arrangement of these optical instruments, but that in the present instance the materials are entirely of English produce.

Let us, however, endeavour to simplify an account of lighthouse optics. It is well known, that a lamp of the ordinary kind would send forth scattered rays, many of which would be wasted, and especially all those which shot upward into the sky. Now, the object to be obtained in this case is the concentration of the rays, and the power to throw them downwards in a given direction across the plane of the sea. For this purpose reflectors are employed: and it has been ascertained that the light thus attained is 350 times greater than that of the common lamp; while that of the largest sort, which is used in revolving lights, is 450 times greater. These reflectors are manufactured by a very long and delicate process. Those of the first class are made of fine copper, thickly plated inside with silver, and polished to the highest degree of brilliancy. The flame which illuminates them is usually derived from an argand lamp, which supplies itself with oil on the fountain principle. This system is called the "catoptric," and includes a variety of distinctions, each of which is registered, as a special signal for sailors. There is the fixed light—the revolving light—the white light—the red light—the revolving red, with two whites—the revolving white, with two reds—the intermittent light—the flashing light, &c. Of these, the most powerful and far-reaching is the white, and next to this the red. There are several optical systems in use for lighthouses, but the principal systems are the catoptric and the dioptric—the former depending upon the reflection of light, the latter upon its refraction. The dioptric is by far the more powerful; the light produced with a lens light being nearly equal to 14 on the reflecting principle; it is also usually preferred by lighthouse opticians, as the chances of its extinction are so very few, and its advantages so great. Nevertheless, in consequence of the cost of the glass lens, which was a manufacture in which foreign countries greatly excelled us, it appears that in 1844, of the fixed lights in England and Scotland, 76 were catoptric, or reflecting lights, and only 18 dioptric, or lens lights. The removal of the duty on glass, will probably in time reverse this state of things.

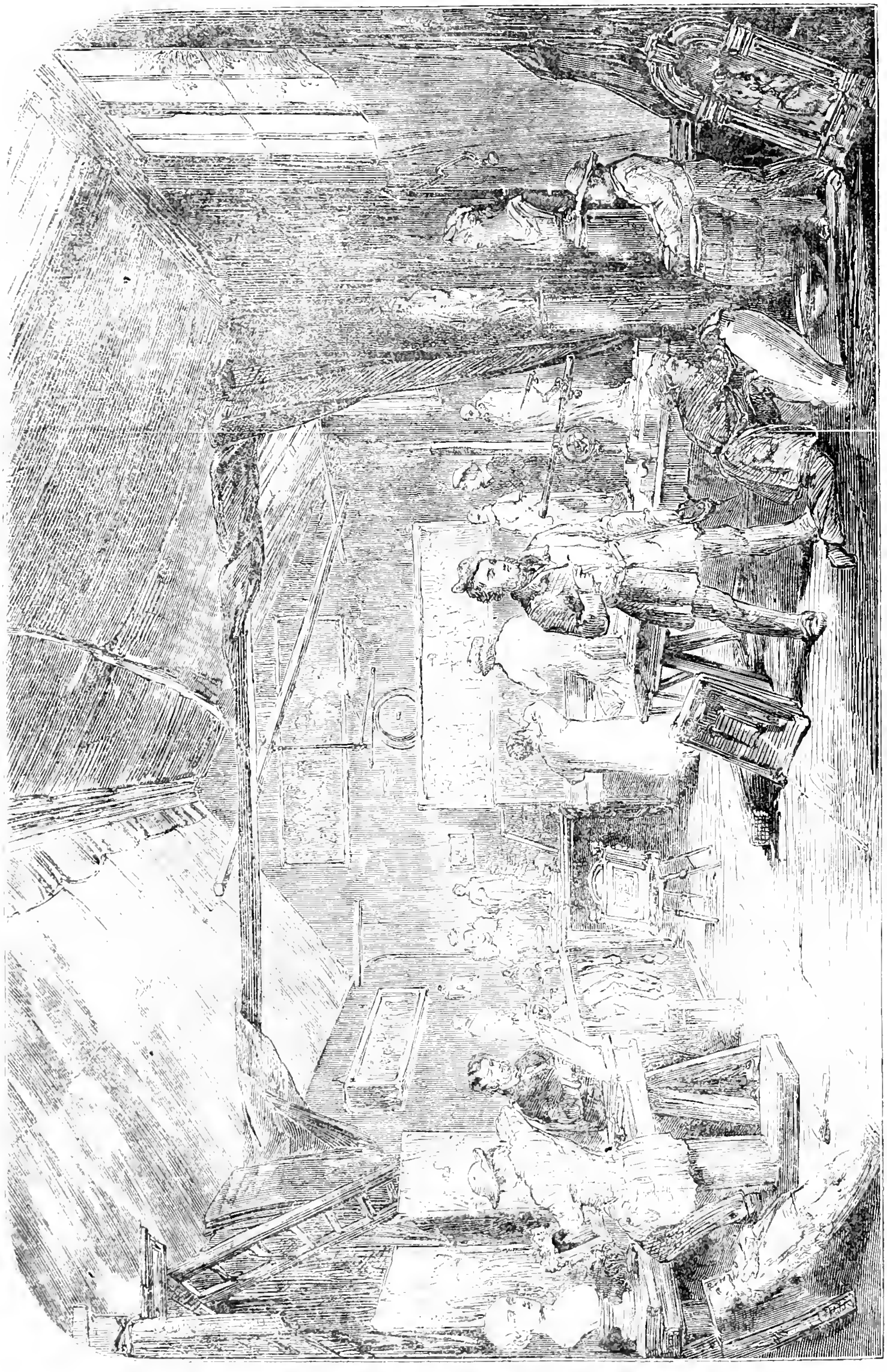
Among all our finest lighthouses, there is scarcely one that surpasses the "Carlingford," on the coast of Ireland. It is 111 feet in height, 48 feet in diameter at the base, and is founded 12 feet below the surface of the water. It was designed by Mr. George Halpin. The difficulties attending a structure, the foundations of which had to be laid so deeply beneath the water, yet requiring, in common with all edifices of this kind, to be made so very strong and secure, will be readily apprehended. Great as these were, however, they were exceeded by the protracted difficulties and constant dangers attending the erection of the Skerrymore Lighthouse, in Argyllshire, which was designed and built by Mr. Alan Stevenson, engineer to the Board of Northern Lighthouses, from whose "Treatise on Lighthouses" the following very interesting account is abstracted:—

The main nucleus of the cluster of Skerrymore rocks was the only one that presented sufficient surface for the base of a lighthouse, and this had been worn as smooth as glass by the constant action of the waves, but was closely surrounded by ragged humps of rock and narrow gulleys, in which the sea incessantly played in rushing coils and eddies. The cuttings for the foundation occupied nearly two entire summers. In this small space the blasting of the rocks was often attended with great danger to all the men employed in the work. The granite for the tower was quarried in the isle of Mull, where piers were also built for the shipment and landing of materials. A small vessel was fitted up for the constant use of the lighthouse during its construction. But one of the most arduous operations, second only to the main building itself, was the erection of a temporary wooden barrack on the rocks for Mr. Alan Stevenson and his workmen. It was finished in the course of the summer; but, unfortunately, a storm arose early in the winter, and swept the whole structure away, leaving no wreck to show even where it had stood, except some iron stanchions, twisted about as though they had been mere osiers, and a great timber beam which had been shaken, rent, and dashed upon the rocks, till it literally resembled a huge bunch of laths. Luckily, the engineer and his men, warned by the previous fate of those engaged on the Bell Rock, had effected their escape on the commencement of the storm. But being without a barrack, many of them, being quite unused to the sea, suffered the miseries of continuous sea sickness on board their little attendant vessel.

A second attempt was now made to erect a barrack on the rock, and this being of much stronger design, proved successful. Here Mr. Stevenson and his workmen retreated every evening after the toils of the day, or during the day when the weather was bad; but it often proved a very alarming place for repose. Perched at a height of 40 feet above the wave-reach, in this singular abode, Mr. Stevenson and 30 workmen passed many a dismal day and night, at times when the sea absolutely prevented any one setting foot on the rocks. They longed and prayed for change of weather, not only to enable them to renew their labours, but often that they might receive needful supplies from the shore, for which they looked anxiously and in vain. "For miles around," says Mr. Stevenson, in the book previously quoted, "nothing could be seen but white foaming breakers, and nothing heard but howling winds and lashing waves. At such seasons much of our time was spent in bed; for there alone we had effectual shelter from the winds and the spray, which searched every cranny in the walls of the barrack. Our slumbers, too, were fearfully interrupted by the sudden pouring of the sea over the roof, the rocking of the house on its pillars, and the spirting of water through the seams of the doors and windows—symptoms which to one suddenly aroused from sound sleep, recalled the appalling fate of the former barrack, which had been engulphed in the foam not twenty yards from our dwelling, and each moment seemed to summon us to a similar fate. On two occasions, in particular, those sensations were so vivid as to cause almost every one to spring out of bed; and some of the men fled from the barrack by a temporary gangway, to the more stable but less comfortable shelter afforded by the bare wall of the lighthouse tower, then unfinished, where they spent the remainder of the night in the darkness and the cold." Notwithstanding all these dangers, however, the Skerrymore lighthouse was safely brought to completion. It is 138 feet high, 42 feet in diameter at the base, and 16 feet at the top. It contains 58,580 cubic feet of stone, being more than double the quantity of the Bell Rock, and five times that of the Eddystone. The entire cost of the Skerrymore lighthouse, including the purchase of the attendant small vessel, and the building of the small pier and harbour for its reception, was 86,977*l.* 17*s.* 7*d.* The light is revolving, and belongs to the first order of dioptric lights, in the system of Fresnal, being of a similar kind to the dioptric apparatus which was to be seen in the Great Exhibition, Main Avenue West (No. 84).

Lighthouses in this country have not hitherto been erected or conducted upon any systematic plan. By recent acts of Parliament, however, all the public or general lighthouses around the coast of England are put under the management of the Trinity House; those around Scotland under the Commissioners of Northern Lights; and those around Ireland under the Ballast Board of Dublin. There is a second class of local lights, for harbours, &c., which are managed by corporations and local trustees under powers given for that purpose. The dues levied are considerable. The average cost for keeping up a fixed public light is about 450*l.* per annum. In America and France the lighthouses are kept up by Government.

THE ARTS OF DESIGN AND DECORATION.



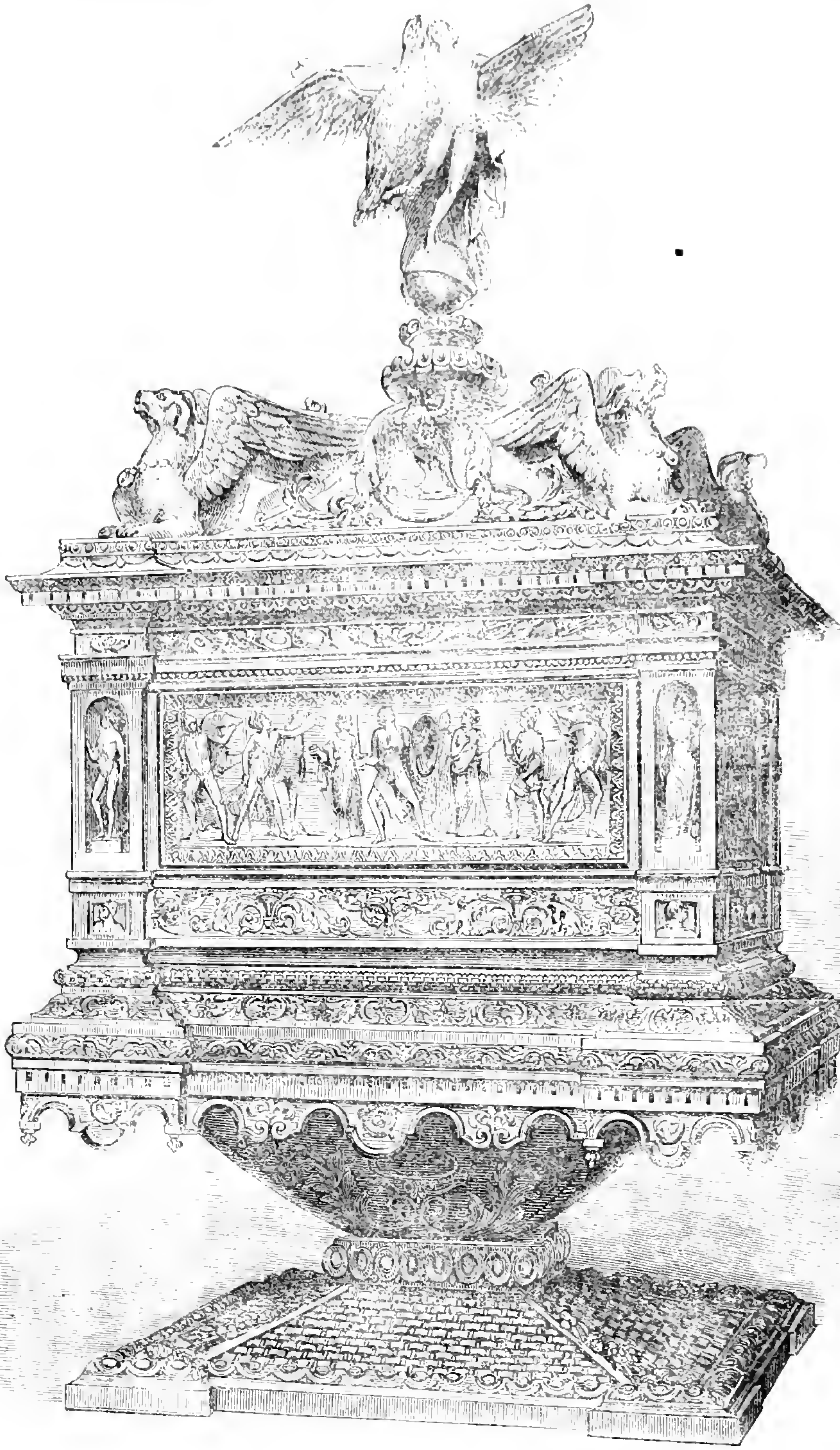
THE WOOD CARVING STUDIO OF MESSRS. COOKES OF WARWICK.

WOOD CARVING.

AMONGST the decorative arts, Wood Carving has a distinct and legitimate position, and, confined within due limits, is always effective. Nevertheless, its province is a restricted one; it should be viewed purely as an appliance for the ornamentation of material when applied to a useful purpose, and not as a work of art *per se.* Another restriction should be put upon the fancy of the operator; namely, that the object decorated be one proper for decoration; that it be decorated with appropriate devices, and that the devices be not in excess as to character, nor in dimensions, so as to risk being injured themselves, or inconveniencing those who are to use the articles to which they are applied. All attempts to confound wood carving with sculpture we utterly denounce; and for the simple reason, that the material is not worthy of a work of the highest art, and that colour in it is more inappropriate to represent the human frame than white marble; whilst it is also less susceptible of fashioning into the round and smooth surfaces than that material. Let any one doubt this assertion, and then call to mind that most objectionable representation of the Crucifixion which occupied a prominent place in the Fine Art Court, or the figure-head of her Majesty close at hand, or the figures (and especially the faces) in that very magnificent production, the Kenilworth buffet, or the human lineaments in any other work of wood carving in the Exhibi-

tion, and compare their relative truthfulness of effect as to contour and colour with that of other objects, such as flowers, foliage, and fancy devices, and they will at once admit the force of the principle that we now contend for.

The two principal contributors in this department were W. G. Rogers, of Carlisle street, Soho; and T. Wallis, of Louth: and their works, which were placed in juxta position on the same wall, were daily visited by crowds of eager gazers, who warmly contested their respective merits. Until the appearance of Mr. Wallis in the field, Mr. Rogers had enjoyed the reputation of being not only first, but almost without a rival, in this interesting branch of art, and, although the Lincolnshire carver now certainly treads pretty closely upon his heels, we must, after a very careful examination of their respective performances, still give the metropolitan artist the preference. We do so in consideration of the greater number and variety of the works exhibited by him, and of the greater success which he has achieved in the application of the art to legitimate decorative purposes. In this he seems to have studied the examples of Gibbons, by far the greatest carver of wood that ever existed, and who, whilst he possessed a wonderful fertility of fancy and facility of execution, knew exactly where to apply them with advantage and propriety. It would be impossible to enumerate all the little beauties of device lavished by Mr. Rogers in the various works—sixty-one in number—which he exhibited: we must restrict our attention to one or two of the larger ones, in the production of which he appears to have taxed his resources to the utmost. No. 61 is a Royal Trophy, carved in lime tree, upon a gold frame, 5 feet by 4 feet, and projecting 1 foot 2 inches. It is intended to represent the Crown as the chief power, the source of all titles and dignities—the patron and promoter of the arts and sciences, field sports, &c. The centre group is composed of musical instruments, scrolls, books, palettes, pencils, coronets, sceptres, chains, swords, and other insignia, bound together by a rich drapery of Spanish point lace, which stands out in remarkably bold relief. In the lower part are medallion portraits, including those of the Queen, Louis Philippe, &c. Around the whole is a border, composed of groups of game, fruit, flowers, fish, and shells. No. 3, a trophy emblematical of "Folly," is also worthy of distinct notice, introducing a skull crowned with a garland of oak leaves, a group of musical instruments, the wings of Time, &c. No. 2 is a large mirror frame, 11 feet high by 9 wide, composed of English flowers and fruits, with various insects revelling amongst them in the style of Gibbons, but including many flowers never introduced by him in his work.

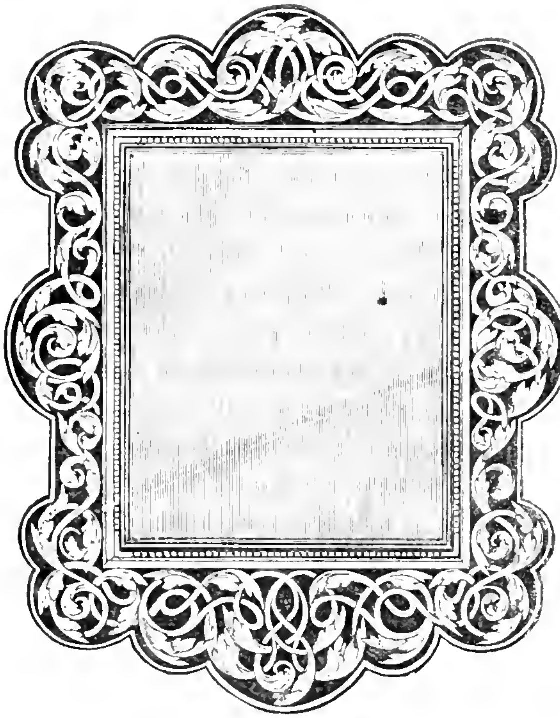


CARVED CASKET IN WALNUT-WOOD.—BY A. BARBETTI, OF TUSCANY.

The carved box wood cradle, by the same artist, exhibited by her Majesty, must not be passed unnoticed, although we by no means participate in the wild admiration which it has excited amongst the numberless mothers and daughters of England, who have gazed enviously at it. The shape itself is not elegant, being heavy, and more like a sarcophagus than a cradle; and the decoration though doubtless appropriate as "symbolising the union of the royal house of England with that of Saxe Coburg and Gotha," is neither picturesque nor interesting in a general point of view, while the execution, though exquisitely neat, is, perhaps, a *tant soit peu* tame.

Mr. Wallis has some wonderful productions, though, as already observed, fewer in number and less varied in character. He has worked, perhaps, with more the spirit of an artist than Mr. Rogers, and has aimed almost exclusively at the accurate embodiment of beautiful objects of nature—such as birds, foliage, flowers, insects, &c., but without regard to conventionalities of form or adjunct. Nothing can equal the downy softness of his dead game, producing, but for the colour, the effect of perfect illusion, nothing can be more exquisite than the delicate articulation of his foliage, copied, as he states, from nature: not even Mr. Rogers can surpass him in the delicacy of handling which he has displayed in the production of the minutest objects, and in the boldest efforts of under-cutting: but his works are more to be admired for their individual beauties than for their applicability to decorative purposes. Mr. Wallis's principal effort is a group of flowers, &c., emblematical of spring, carved in a solid piece of lime tree, measuring 5 feet high, by 2½ wide, and projecting thirteen inches. Spring is allegorically represented by the grape buds and apple blossoms; and in this space we have no less than 1060 buds and 47 varieties. Here we see the blue-cap titmouse picking insects out of an apple blossom; there another taking food to its young, which are partially concealed in their nest; in a third, caterpillars dragging their slow length along. A shepherd's crook and lamb's head are added, symbolical of the season.

The whole of this work has been copied from nature, and was executed expressly for the Great Exhibition.



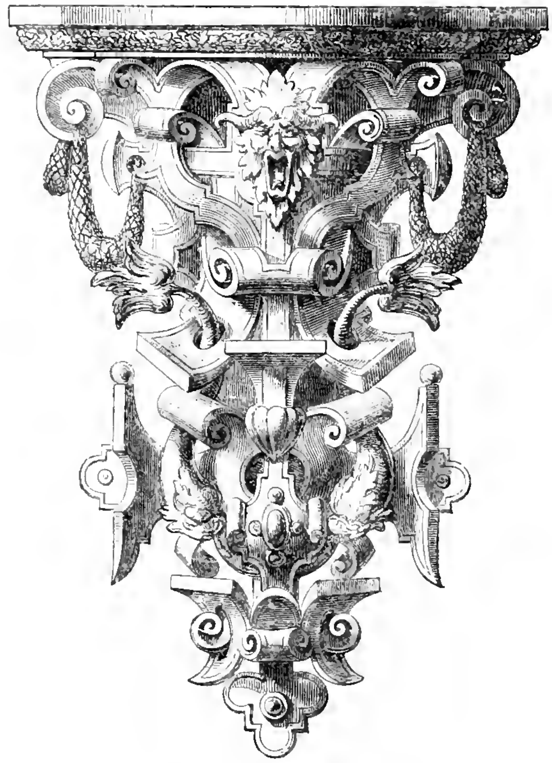
CARVED FRAME IN BOXWOOD.—ROGERS.

Amongst the other contributions in this line on the British side of the Building, we found several who dealt in small conceits, more or less creditable in execution, but with little of a useful character, even as matters of decoration, to recommend them. Richard Fuller, a self-taught artist, of Farnham, has a village merry-making, somewhat roughly handled. G. Cook has a piece of carving in lime tree, "Virtue surmounts all obstacles;" another of Alexander attacking the Persians, and another of the Duke of Wellington at the battle of Waterloo—the last two after engravings which may be bought for a few shillings, and which are much more effective than these laboured copies. Perry, of Taunton, another self-taught artist, (who states that he did a great part of the carving in the royal cradle,) had a small vase carved out of a solid piece of boxwood, embellished with various allegorical devices, in diminutive size, illustrative of the Great Exhibition: but here, again, is labour comparatively thrown away, by reason of the nature of the material. Mr. Field exhibited a specimen of wood carving of about the middle of last century, by Demontreuil a childish composition, with bird's nest, &c. Arthur Harvey, of Penzance, had several small subjects in boxwood, as the "Equestrian Statue of Peter the Great," the "Laocoön," wild sports of the East, "Attack of the Lion," which are executed in a hard manner. R. Pullen, of Farnham, has also some *pièces de genre*, attempted in the same material with moderate success. J. Gordon, of Bristol, had several subjects, including a "Vase from the Antique," and a "Belisarius," in boxwood, the last named executed with great finish and delicacy.

CARVED FRAME.—BARBETTI, OF TUSCANY.

From Ireland we have several examples of carved furniture, and ornamental work, executed in Irish bog-yew, and exhibited by Mr. Jones of Dublin, the execution of which, barring a little crudeness, is generally creditable. Some of these we intend engraving.

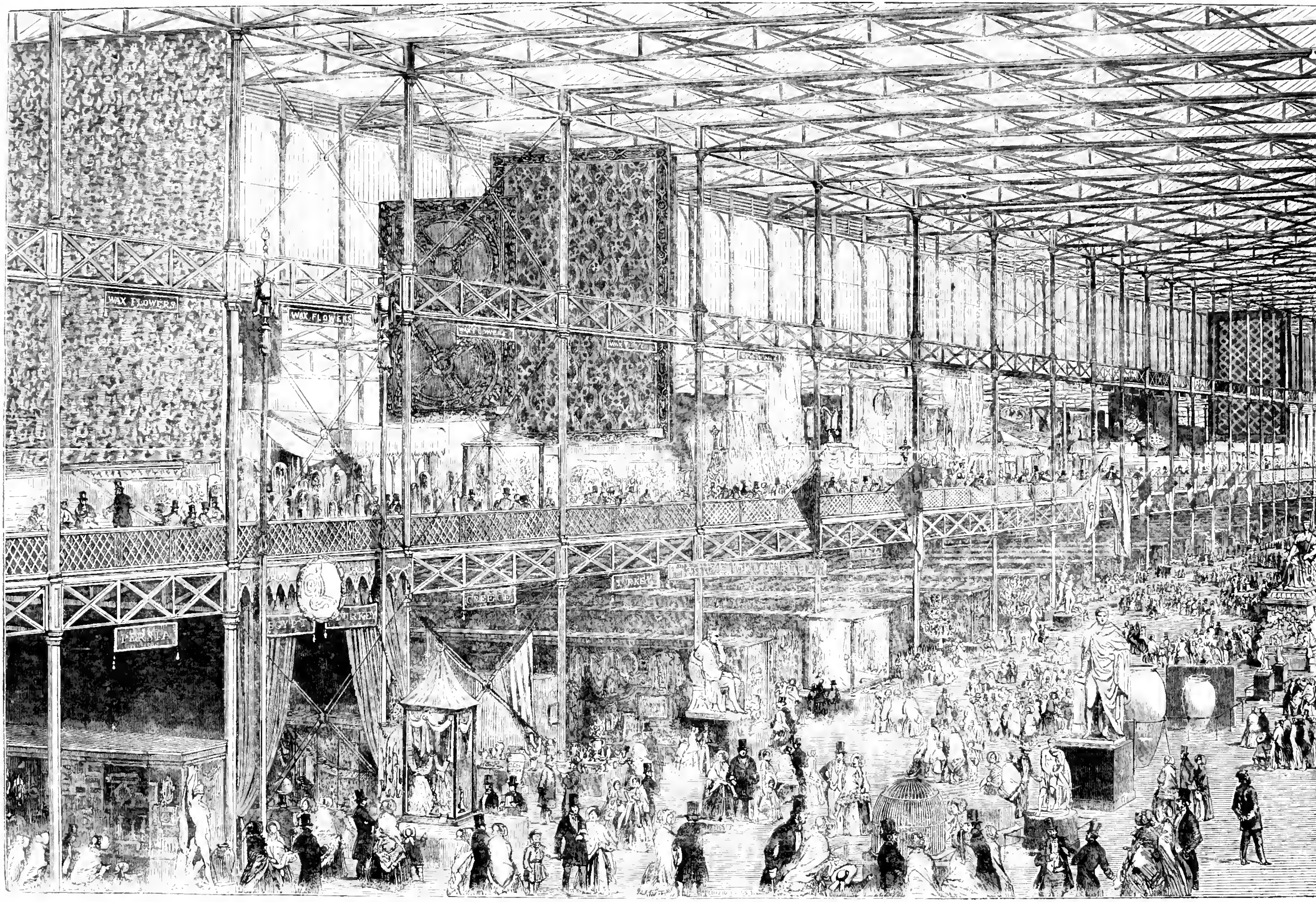
From Scotland we had very little in this line. We remarked, however, in the Fine Art Court, a pier-table and mirror in carved wood, "with a design representing the seasons, Peace, War, Commerce, Navigation, Science,



ELIZABETHAN BRACKET IN BOXWOOD.—ROGERS.

Art, and the progress of civilisation," wrought in a wood of a very coarse grain, in a barbarously clumsy style. Jersey sent an oak sideboard, with a representation of King John signing Magna Charta in figures nearly two feet high—rather stiff in character, but not badly executed. Mixed up with this class of wares was a "God save the Queen," in wood letters, by a Mr. Thompson—all, doubtless, cut out of his own head! In short, there is no end to the ingenuity of the whittlers of wood, as Brother Jonathan would call them.

In the above observations upon wood carving, we have considered it in the light of an art, entitled to rank, according to its degree, with the other "arts of design." Of late years, however, the manufacturing spirit of the age has prompted several very ingenious individuals to attempt wood carving by machinery, and, what is worse still, imitations of wood carving in various materials, as leather, *papier mâché*, *carton pierre*, gutta percha, &c. One word might serve to denounce our wrath against these presentments; they are impostors. They pretend to be what they are not; they look something like the real thing at a distance, and mock our credulity. When we come to examine them closely, we find them wanting in all that sharpness and flow of outline, all that variety of conceit in repetitions of similar objects, which distinguish the hand of the inventor and producer, and the labour which is loved for itself. For vulgar, clumsy-sighted people, these imitative works of art may do well as make-believes; and all the punishment we might wish them for their bad taste would be, that they may never have anything better to look at, nor the capacity to appreciate anything better,—but that, as by such exhibitions they inflict a positive nuisance and eyesore upon those who have occasion to come near them in their villas *ornées* and Cockney *boudoirs*, they are entitled to some signal penalty for the sake of public justice and public example. Whilst, however, the commonwealth



THE EAST NAVE.—FOREIGN DEPARTMENT.—LOOKING FROM THE SOUTH-WEST OF THE TRANSEPT.

HISTORY OF INDUSTRIAL EXHIBITIONS.

I.—Introductory Observations.

THE magnificent ovation which this country has paid to industry, under the enlightened influence of the Prince Consort, will hereafter be referred to by historians as a great and decisive epoch in the history of the working classes of the world. The skill that realises the dreams of science, that follows with unerring fingers the pencil of the artist, which multiplies for thousands of readers the writings of the best and greatest men, will henceforth claim its honourable place. The weaver at his loom will have his recognised position; the worker, who scatters the seed abroad upon the bosom of the earth, will feel the honour of his calling. Industry, whether exercised to fell an oak or to create an Act of Parliament, is equally meritorious. Each man in his appointed sphere. Each has his speciality, and honour be to him who works it out—honour to him who weaves the canvas, as to him who paints thereupon with the power of a master. There is honour in the conscientious exercise of the most limited power, as in the development of the most mighty conception. The greater the power, the more devout the veneration: the higher the throne, the louder the hymn of praise. It is only now that we are beginning to wake from the old hero-worship—to notice the honest men who bend the knee to our idols—to honour the moral power that works and suffers, while intellectual power soars aloft, and wields, often with a tyrannical sway, the sabre or the pen.

We are told* that "if we examine the moral character of weavers, we shall find them from the earliest periods, distinguished by a propensity to scrutinise the received dogmas of the times, and generally foremost in the race of liberal opinions, zealous in supporting the promulgation of new doctrines, full of hostility to the encroachments of tyrannical power, disposed to fanaticism in religion, often of a gloomy and determined cast of character, and pervaded with the most entire devotion to the cause they espouse—a circumstance to which the peculiarity of their religious feelings mainly contributes. The doctrines of Luther were first sown and first took root amongst the weavers and manufacturing population of Saxony, a soil the most genial for the reception of the new religion; and posterity is indebted to them for having received and sheltered that vigorous controversialist, and for having nourished and fanned the spark which afterwards blazed out far and wide, enlightened the European mind, and freed it from the chains of darkness and superstition. Amongst men less disposed to inquire and to question, and more inclined to bow to the dictates of authority, the nascent spark might have been extinguished. The weavers in England, also, were amongst the earliest supporters of the Reformation, and were cruelly persecuted by Bonner. As, in the commencement of the sixteenth century, they had been among the foremost to receive and adopt Luther's doctrines, so we find them, in the commencement of the seventeenth century, equally ready to receive those of Puritanism: and they encountered, perhaps in a slighter degree, persecutions from the English hierarchy, similar to those which their predecessors had sustained from the Roman Catholics. Great numbers of woollen and worsted weavers were driven out of the country by the intolerant hand, and they also met with much severe treatment from Wrenn, Bishop of Norwich. Some of them fled to Holland, others to the new settlement in Massachusetts Bay. Glasgow, when the weavers were a corporate body in 1528, was early distinguished for its zeal against Popery; and, in the middle of the seventeenth century, was stanch in supporting the Covenant. The free spirit which animated the Huguenots of France, and the consequent disgust with which Louis the Fourteenth regarded them, was, in all probability, the cause of the revocation of the Edict of Nantes. This measure drove fifty thousand Huguenot families from France, they were chiefly weavers, and twenty thousand of them settled in Spitalfields, London, and gave a new impulse to the English silk manufacture."

Richard Guest's view of the weaver's mind is strengthened by their present social position. Ever ready to weigh public questions for themselves, prone to discussion, sensitive by blood, and inquisitive from habit, they are quick to master new ideas, ever prone to adopt innovations. In religion, as in political theory, they scorn control, and are restless and impatient while they imagine that they are unjustly dealt with. They are proud of their calling, and honour their brotherhood; and, as an industrial class, display, perhaps more than any other, those virtues which we are beginning to respect in the working-man as in the listless lord. The time is now fast approaching, when, at the hands of the country, they will receive befitting acknowledgment of their social value; when their moral qualities will claim that respect which has hitherto been exclusively lavished upon brilliant intellectual capacity, or virtue in velvet. Men are beginning, with Emerson, to respect a man who can do something well. Perseverance, as a quality, has not been hitherto sufficiently respected; yet it is the prominent characteristic of the English mind.

We have mistaken the aim of national industrial exhibitions generally, but more particularly of the promoters of our Great Exhibition, if that aim be not to vindicate the worth of patient labour, as well as the grandeur of science, and the influence of art—to acknowledge in the face of the world the hand that realises the dreams of science and the misty conceptions of the artist. The social effect of an alliance of art with commercial industry cannot be overrated. At the present time it is generally accepted that the popular cultivation of art tends to the refinement and enlightenment of a community. All steps which tend to diffuse art, tend undoubtedly and directly to raise the popular character; and it is difficult to fully estimate and comprehend the posible extent of good a cottager would derive from the introduction of household objects into his humble abode, moulded in forms of grace and beauty.

* Richard Guest's compendious "History of the Cotton Manufacture."

II.—Art in France, from the XIIIth to the End of the XVIIIth Century.

In treating of the effect of industrial exhibitions upon the manufactures and habits of a people, it is necessary first to understand thoroughly and clearly the conditions, as regards art and skill, in which they were when they first adopted the scheme of gathering their collective resources under one great common roof. We must premise that France should be looked upon as an exceptional case. She excelled in taste and manufacturing skill at a very remote date. Even in the thirteenth century, her artisans were renowned in other countries for the superior skill and taste with which they manufactured goldsmith's work and stained glass, and for the beauty of their illuminated manuscripts. These excellences are matters of history. We have only to turn to the career of Jacques Cœur (under whose name a great agency conveyed the Parisian manufactures to the Great Exhibition), the great capitalist and merchant, to recall that unexampled brilliancy of industrial production, which in the olden time satisfied the luxurious habits and tastes of the nobles. Under Francis the First, however, the grandeur and inimitable graces which characterised the labours of the *renaissance*, showed manufacturing skill in intimate union with art. Coming down gradually nearer our own times, we may mark every epoch in French history—deeply as her annals are stained with native blood and kingly debaucheries—brightened with a national effort in favour of art-manufacture. The establishment of the silk manufactures of Lyons, in the year 1450; the excellences of the old looms of Paris, Beauvais, &c.; Colbert's Gobelin tapestry establishment; the carpet manufactories of Savonnerie; the Marquis de Fulvy's porcelain manufactory (the first established in France), reared at Vincennes in the year 1738, and which was afterwards sold to the *fermiers généraux*, who transplanted it to the village of Sevres, and laid the foundation of those inimitable productions known as Sèvres ware—these are data which give indisputable proof that the French people have, for ages past, enjoyed peculiar advantages in the cultivation of decorative art.

In textile fabrics, and manufactures of general use, however, they were much behind the rest of the world, till within a comparatively recent period. Towards the middle of the seventeenth century, M. Chaptal, the historian of French industry, declares that France possessed looms only capable of producing the coarsest materials adapted to the wants of her population. Her fine cloths were imported from Spain and Holland; her best silks came from the Italian looms; other fabrics came from England; and Holland and Brabant supplied her with linens and lace. The advance of Colbert to power, however, changed the face of matters in this respect. The fetters were struck off from native manufacturers, skilful foreign workmen were called in; the two great Indian companies were formed; exportation and importation—an extended interchange—were encouraged by lessened duties, and a premium of five francs per ton was allowed on all new vessels. These enlightened regulations soon filled the ports of France with foreign merchantmen, and gave a most healthful impetus to the industry of the country. If commerce owes its revival in France to the minister Colbert, its principal branches owe him more, inasmuch as he was the first to establish them in his native country. He tempted the most distinguished foreign manufacturers to Paris, and by dint of liberal encouragement planted them in France, and set them to teach native artisans; and the result was, that within the short space of ten years 42,200 skilful clothworkers were settled in the provinces of the country.

It is impossible to over-estimate the debt of gratitude due to the memory of Colbert from his country. It was he who established the Gobelin manufactures, and placed the celebrated painter Lebrun to direct these unrivalled productions. It was he who obtained from Louis XIV. an edict, dated 1664, setting apart the sum of one million (worth two millions in the present time) to encourage manufactures and maritime commerce; and it should fairly be added that Louis entered into the enlightened views of his minister with unusual alacrity. It was Colbert who reared the Invalides, the Observatoire, and the gates of St. Denis and St. Martin. It was Colbert who opened the royal libraries to the public, and instituted searches in all parts of the world for valuable works to complete the Bibliothèque Royale de Paris. At his command, merchantmen spread their canvas once more to the winds; Art leant over the weaver at his loom, to trace upon the growing fabric tints and lines of beauty; and Science rose to give a purpose to the mechanic's skill.

Suddenly the merchant's sails were furled, the loom stood still, and the mechanic left his bench to the beating of drums. A musket was in the hand of every Frenchman; Commerce for a while stood still to watch the conflict; but even in these times of strife and bloodshed, some homage

of taste are devising the proper mode of punishment, we must only hope that no squeamish delicacy will prevent individuals from pointing "the slow unerring finger of scorn" at all such efforts of spurious adornment, whenever they are thrust in their way, just as they would denounce a mosaic chain, a paste diamond pin, or a pinchbeck bracelet, which was attempted to be palmed off upon them as real jewellery. Independently of this falsity in appearance, which applies to all the above "manufactured products," there is about gutta percha, *papier mâché*, &c., another falsity much more to be deprecated in a utilitarian point of view: "breach of promise" of service; as any man may find out to his cost who subjets them to ordinary wear and tear for a twelvemonth. We have met with these castings in paper and gutta percha on sea and land, in steam-boat and tavern parlour, and we have scarcely ever met an instance where some member of the family group had not been torn or shaken from his allegiance by the force of circumstances.

With respect to the application of carving in the decoration of articles of furniture, we shall from time to time have occasion to speak, in the case of various examples, both of British and foreign make, which we purpose illustrating. It may be proper, however, to add a few general observations upon this branch of the subject.

The exhibiting artists, both British and foreign, with few exceptions, showed great skill of handicraft, great inventiveness, and a determination to spare neither labour nor expense in the production of works which they fondly consider will be admired for the amount of decoration lavished upon them. In aiming at striking effects, however, they have very often gone into an undue excess of ornamentation; and, in not a few instances, in the choice of decorative devices, have lost sight of what would be appropriate in that light. Accordingly, we have high art—or what assumes to be such—playing second fiddle to the cabinet-maker; and poetry—poetry run mad sometimes—decorating the footboard of a bedstead, the legs and back of a sideboard, the various limbs of an arm-chair, &c.; the conformableness of which to their several useful purposes is absolutely impaired by the obtrusiveness of these devices, which break that smoothness of outline so essential to comfort in contact, and to pleasurable contemplation in the mind's eye. All this is wrong. The decoration of the material of a work of utility should be a secondary consideration—beauty and convenience of form the primary; above all, lightness of appearance, combined with actual strength of structure, which can never exist in perfection when a single square inch of wood projects beyond the necessary sweep of outline, however highly and ingeniously it may be carved. Our upholsterers would do well to consult the exquisite models of carved furniture from India and from China, in which the true principle is adhered to—where all is elaborate in beauty, but elaboration within the limits prescribed by utility; and, above all, where the decoration, instead of constantly worrying one with novel and extravagant conceits, is purely conventional—rich and satisfactory in the forms, without taxing the observer to inquire into its story or intentions.

Passing from these remarks, we now proceed to notice the names of a few of the principal foreign contributors of carved furniture. France was represented by a numerous array in this line, amongst whom we must notice Jeanselme upon the score of general propriety: more ambitious were Fourdinois, whose elaborately constructed buffet stood in the entrance to the Gobelins room, Barbedienne (who obtained a council medal for a sideboard), and Lienard, who had a panel of sporting subjects in pear-wood and an ebony cabinet in the Main Avenue. From Belgium we had but a limited number of contributions, amongst which were only remarkable some ecclesiastical subjects (the "Virgin crowned by Angels," a "Crucifixion," &c.) by Geefs, and a carving commemorative of the "Great Exhibition of 1851," by Vandermeersch.

Switzerland has a style of her own, which, though partaking of the offence of all picture-furniture, must be excused for its evident genuineness, and the hearty *amour de pays* with which national scenes, national customs, and national costumes are, upon all occasions, selected as the devices. An artist of the name of Leeman, also, has a well-carved representation of the beautiful fountain at Nuremburg—an interesting object of the Gothic period; and, though not strictly coming under the definition of carving, we must mention, as highly interesting and creditable productions, two turned cups (decorative), and a watchstand, produced by E. Meystre, of Lausanne, a young man who has the misfortune to be deaf, dumb, and blind, and who is a pupil of the Blind Asylum of that town. Poor Edward Meystre! How inscrutable are the ways of Providence, and how inextinguishable the spirit of enterprise and industry in man—well-conditioned man! Who could have thought, when the great and glittering exhibition of the world's choicest goods was projected, that the rumour of it should reach a poor benighted youth, with neither sense of sight nor hearing, nor speech, and that he, from a far-off land, should send his humble tribute to a display which has delighted the eyes of millions happier in this respect than he! If a word of acknowledgment and encouragement may cast a ray of light and warmth over that dark existence, let us not grudge it.

From Tuscany, that old field of classic art, we had several specimens of exquisite beauty, by Barbetti and others, two of which we engrave in the present sheet. The style of production in this quarter, laborious and florid in the highest degree, is marked with a propriety which excepts it from some general observations we made in an earlier part of this article.

Portugal has long held a respectable rank for the elaborate beauty of her carving, and the fine quality of the woods employed; and we observed several interesting examples of superior handicraft and excellence of material.

Finally, Greece, amongst her sixty-one contributions, sent two works in the Byzantine style, executed by the Rev. Triandaphylos of Athens, namely, a carved cross, and a carved picture of the "Annunciation." These works are remarkable as specimens of a style of art now almost extinct, being a remnant of the Byzantine period, and which still lingers in some of the convents of Greece, and particularly at Mount Athos. The carving, which is done with graving instruments, is very minute, in slight relief, upon the plane of the wood—a box-wood which is abundant in Greece, and appears to be of a very fine grain. The crucifix, which does not measure more than a foot in its largest dimensions, is covered on both sides with scriptural subjects—fourteen on each side—so that each subject occupies only from an inch to a couple of inches of the surface. In the carving representing the "Annunciation," the figures are larger, and the form oval, the band being surrounded with twenty-five heads of saints. The government of Greece has of late years done a good deal to promote this style of illustration, in a School of Arts established at the cathedral at Athens.

In our account of the Kenilworth Buffet given in our last, we stated that in its production a new practice had been adopted by Mr. Walter Cooper, namely, that of "pointing," as employed by stone and marble sculptors, by which greater accuracy in copying from the plaster model is attained than would otherwise be possible. This is a novelty in "the process of production" which might almost have entitled Messrs. Cookes to the honour of a council medal: the claim was at least as good as that of M. Barbadienne, who pretended to no novelty either of principle or practice in his famous sideboard. However, the Council of Chairmen have thought otherwise, so we have nothing further to do with the matter, except to call attention to the fact, and to the Engraving on page 116, which represents the studio of Messrs. Cookes and Sons, from a sketch by Mr. Dwyer, with the pointing machinery in use, fixed to one of the benches.

VIEW IN THE EAST NAVE OF THE GREAT EXHIBITION.

THE large Engraving standing across the next two pages represents a considerable portion of the East, or Foreign Nave, looking from a point near its junction with the South Transept, taken from a daguerreotype sketch by Claudet. Amongst the principal individual objects included in it, are "The Boy at a Stream," by Foley; the Koh-i-Noor in its cage, the large Spanish Wine Vases; some of the Italian Sculptures; the colossal zinc Statue of the Queen, &c.

The Bijouterie and Sculpture in the Great Exhibition.—A writer in the *Art-Journal* says:—Has any body explained, or can any body explain, the strange and universal attraction exercised by Precious Stones? an attraction confined to no nation or class, rich or poor, educated or uneducated, wise or foolish. When one observes, and feels, the potent fascination of these small bits of sparkling stone, one is half tempted to give into the dreams of Rosicrucians, and the theories of alchemists. For what is the charm? It cannot be simply that they represent so much money; for a packet of 1000*l.* bank notes does that much more precisely; nor is it their beauty; for there are innumerable things more beautiful than they. But diamonds, rubies, sapphires, and all those rich products of nature's laboratory, seem to draw not only the eyes, but the very hearts of men by a mysterious force. The world improvers say this folly is to vanish before their teachings. It may be so. At present the Great Exhibition, not a bad test of popular inclinations, gives no indication of their decline. Another problem which I should like to see explained, is the intense eagerness of the people to see the Austro-Italian statues. An attentive frequenter of the British Museum or the Louvre, who has watched the listless indifference with which the masterpieces of Greek art are regarded by the many, can hardly believe in any real and diffused taste for sculpture, or any appreciation of it *as Art*, among the people of England or France. The only quality that seems to strike them is, generally, the exact representation of some trivial accessory—a veil, the coil of a rope, or the curl of a wig. The truth is, their education and pursuits naturally lead them to a lively sympathy with the industry that conquers technical difficulties; and not at all, with the genius that embodies a poetical idea. There is, however a vast deal of this preference of the curious over the beautiful, in the rich vulgar as well as the poor; as the admiration of the Veiled Lady abundantly proves. As to the good to result to the art of Sculpture, it would be absurd to hope much, from the display of works many of which are more calculated to mislead than to form the taste, unless indeed—which is possible—it be necessary to educate the wholly untaught eye, through imperfect models up to perfect. The production of the products of the great age of Greek Art (which England has the inestimable privilege of possessing) being the test, how much of this education must be passed through before that is arrived at! Those who *have* arrived at it are counted by tens, if not by units.

Proposed Statue of Prince Albert.—A wish has been expressed, or at least, a suggestion has been thrown out that a colossal bronze statue of His Royal Highness should mark the site of the Great Exhibition, when the present edifice has been removed. We trust that, if any such public testimonial be decided on, the selection both of the design and artist will be intrusted to gentlemen possessing a little more knowledge of the art than the large majority of members of the Committees who have been elected to decide on the Peel monuments. What with the ignorance and the jobbing propensities of such bodies, there are not half a dozen statues of any considerable size in this great metropolis, that are not deservedly objects of ridicule or contempt.

remained for her. Art was retained to pamper the rich sensualist, but never passed the threshold of the poor. Before the French Revolution burst asunder the whole social fabric, and left a chaotic mass to reorganise its discordant atoms on a more liberal basis, the beauties of art were the enjoyment only of the wealthy. No schools existed for the tuition of humble aspirants; no open hand was proffered to the struggling artist. Yet the tide of public favour was turned in favour of art, not by the promoters of the Revolution, not by an upstart from the ranks of the people; but, on the contrary, by a noble, who was proscribed before he could carry his plans into effect.

An appointment which immediately followed the installation of the Directory was that of the Marquis d'Avèze, in conjunction with MM. De Parny, De la Chabaussière, and Caillot, as manager of the Academy of Music, then called the Theatre of Arts.

"We received," the Marquis tells us in a pamphlet on the subject, "this fine establishment from the hands of the artists united for its support, in the most wretched state—in a position, indeed, menacing immediate downfal. Thanks to the efforts of our management, which lasted for three consecutive years, we bequeathed this splendid theatre to our successors in a most satisfactory condition, and in that high road to success which it has constantly followed until the present time (1844).

"In the year V. of the Republic (1797), I had not yet quitted the Opera, when the Minister of the Interior summoned me to undertake the office of Commissioner to the Manufactures of the Gobelins (tapestries), of Sèvres (china), and of the Savonnerie (carpets). I had no need to stay long in these establishments to perceive the misery in which they were plunged. The workshops were deserted—for two years the artisans had remained in an almost starving condition; the warehouses were full of the results of their labours, and no commercial enterprise came to relieve the general embarrassment. Scarcely can I depict the effect produced upon me by such a scene; but at that moment a bright thought presented itself to my imagination, and appeared to console me for the miseries of the present in the hopes it offered for the future. I pictured to myself, in the most glowing colours, the idea of an exhibition of all the objects of industry of the national manufactures. I committed my project to paper, I detailed the mode of its execution, and prepared a report, addressed to the Minister of the Interior, which was written throughout by my own hand, and delivered by me to M. Laneel, then at the head of the section of Arts and Manufactures, in whose office the document in question should still exist. My reports soon received the approbation of the Minister of the Interior, M. François de Neufchateau, who commanded me to carry it into effect by every means useful and suitable to the Government.

"The *château* of St. Cloud was then uninhabited, and completely unfurnished; and this appeared to me the most appropriate and eligible spot for the exposition which I had projected, and likely to invest the exhibition with all the magnificence and *éclat* so necessary to attract strangers, and to further the sale of the objects exhibited, the produce of which might mitigate the sufferings of our unhappy workmen. The *château* of St. Cloud was obtained without difficulty. I established myself there, and requested the attendance of MM. Guillamont, Duvivier, and Salmon, directors of manufactures. I explained to them the intention of the Government, and found all these gentlemen ready to further this object with zeal and activity. In a few days, by their obliging exertions, the walls of every apartment in the *château* were hung with the finest Gobelin tapestry; the floors covered with the superb carpets of the Savonnerie, which long rivalled the carpets of Turkey, and latterly have far surpassed them; the large and beautiful vases, the magnificent groups, and the exquisite pictures of Sèvres china enriched these saloons, already glowing with the *chefs d'œuvre* of Gobelins and Savonnerie. The chamber of Mars was converted into a receptacle for porcelain, where might be seen the most beautiful services of every kind, vases for flowers, in short all the tasteful varieties which are originated by this incomparable manufacture. In the centre of the saloon, surrounded by all these beauties, was a wheel of fortune, containing lottery tickets eventally to be drawn: every ticket was to obtain a prize of greater or less value; the price of each ticket was twelve francs. I had attained to this point when the Minister gave me an assistant in the person of M. Lessure, a young man of great merit, with uncommon zeal and intelligence. I had already, for some time, enjoyed the advantage of the services of M. Peyre, a young architect of exquisite taste and distinguished talent. He it was who superintended the arrangement of the exposition; and when this was completed, I referred to the Minister to fix the day for its being opened. It was decided that this should take place in the month of Fructidor; but previous to that time a number of distinguished persons in Paris, and many foreigners, visited the exposition, and made purchases sufficient to afford a distribution to the workmen of the different manufactures, thus yielding a little temporary relief to their necessities. The fame of this forthcoming exposition inspired the citizens of Paris with an eager desire to enjoy it as soon as possible; they anticipated with impatience the 18th Fructidor, the day fixed for public admission to St. Cloud. The courtyard was filled with elegant equipages, whose owners graced the saloons of the exposition, when, in the midst of this good company, I received an official notice from the Minister to attend him immediately, and to defer the opening of the exposition. I obeyed the mandate on the morning of the 18th. I waited on the Minister, from whom I received an order to close the *château*. Already on the walls of our city was placarded the decree of the Directory for the expulsion of the nobility, with an order for their retirement, within four-and-twenty hours, to a distance of at least thirty leagues from Paris, and this under pain of death. My name was in the list; and, consequently, my immediate withdrawal was imperative. The barriers were strictly guarded, and it was impossible to pass them without the order of the commandant. My position was doubly painful: on the one hand, it was essential to obey the decree of the Government; on the other, I had an account to render of all the treasures in the *château* of St. Cloud. I found no difficulty in explaining my position to the Minister and the commandant of the place, the Marshal Augereau. I requested him to furnish me with a sufficient force for the protection of the *château*, in which so many precious objects were deposited. He gave me a company of dragoons, under command of Captain Vatier, and ordered a passport for me, by means of which I could leave Paris and return to St. Cloud. I caused an inventory to be made in my presence of all I left in the *château*. I closed the gates, and delivered the keys to M. Marechau, the keeper, in compliance with the order of the Minister. I posted the military which had been granted to me around the *château*, and, my duties fulfilled, hastened to obey the decree of the proscription.

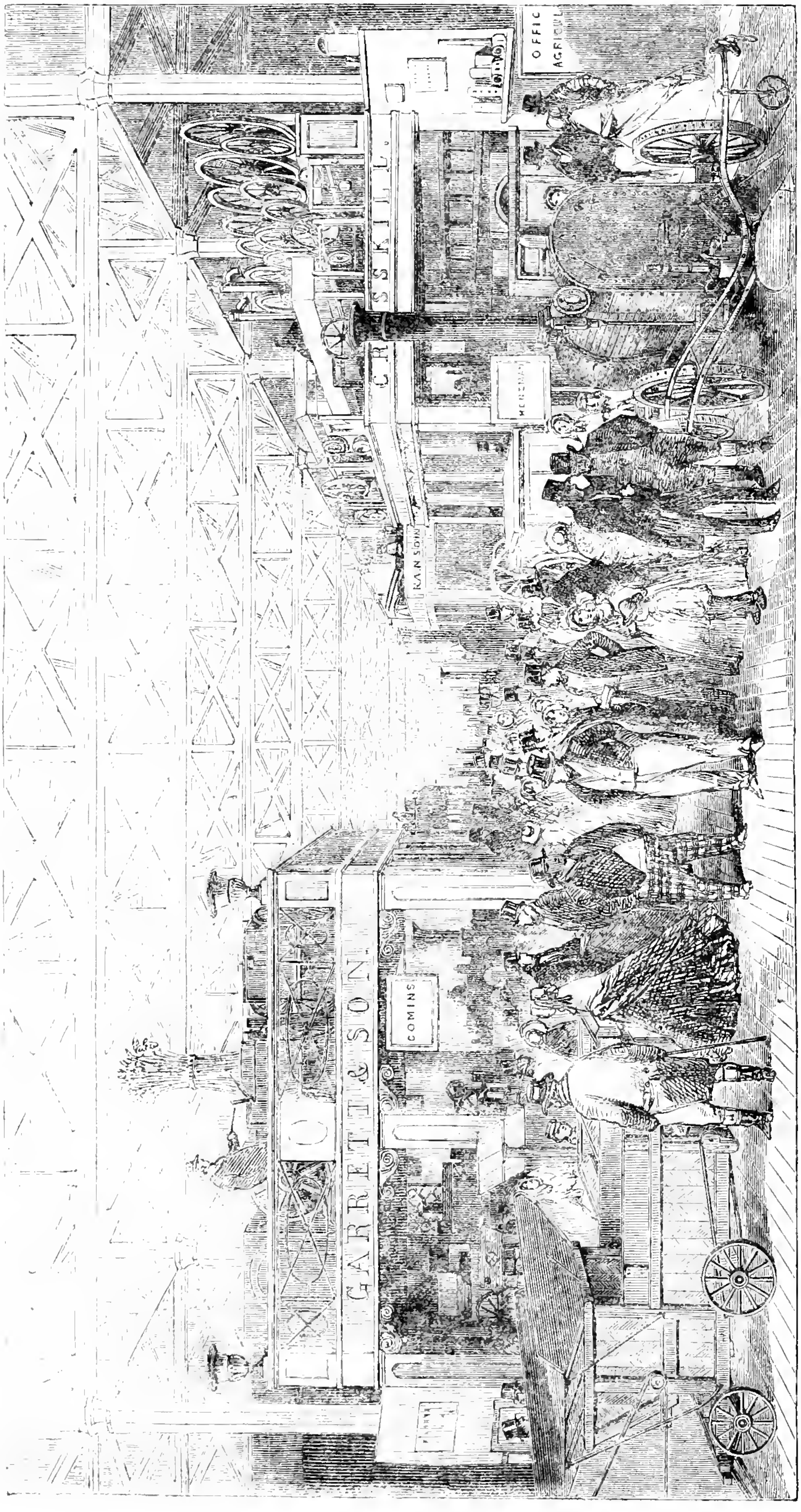
"Such is the true and exact history of the first idea of a National Exposition, and of the first attempt to realise that idea."

This modest narrative of the originator of these exhibitions was written by the Marquis so late as the year 1844, in reply to the reports of MM. Challamel and Burat, in which the honour of their origin was accorded to François de Neufchateau.

The labours of the Marquis, however, in the cause of the industrial arts did not terminate with his compulsory retirement; for, on his return to Paris, at the beginning of the year 1798, he forthwith collected an exhibition of native art-manufactures within the spacious house and grounds of the Maison d'Orsay, Rue de Varennes. It was to be expected that the specimens of manufacture he assembled would consist entirely of costly goods, inasmuch as manufactures of any excellence were not within the reach of the great body of the people. The masterpieces of manufacturing skill were, therefore, to be found exclusively in the palaces of the rich; and from these abodes of luxury he withdrew the gorgeous cabinet-work and marqueterie of Rilsoner and Boule; the clocks of Leroy; the gorgeous typographical productions of De Thou and Grolier; Sevres and Angoulême porcelain; the masterpieces of Vincent and David; the choicest fabrics of Lyons; and other costly products of the artist and the artisan. The exclusive character of the exhibition was the result, not of D'Avèze's wish, but of the condition of French society. He led the way which has been so faithfully and happily followed; he created in the hearts of the manufacturing population of France that enthusiasm for their calling—that anxiety for the excellence of their national manufactures, which has since distinguished them.

MM. Challamel and Burat have been guilty of a palpable injustice towards the Marquis d'Avèze, by remaining wholly silent upon the subject of his enlightened labours in the cause of art-manufacture, in their zeal on behalf of the accomplished Neufchateau. The year 1798 was a most favourable one for an exhibition of native industry. Napoleon had achieved his most brilliant actions in Italy, and brought the war to a successful termination; the spoils of war had been inaugurated with prodigal pomp, and it was happily suggested that the little collection in the Rue de Varennes should be copied on a grander scale. The Government, bearing in mind the efforts of the Marquis d'Avèze at St. Cloud, and more lately at Paris, determined to erect a "Temple of Industry" on the Champ de Mars. Here the triumphs of war had been celebrated, and here it was resolved that the nursling of peace should receive a national ovation: the olive should be intertwined with the blood-bespattered laurel! This was the first national exhibition of French industry. By exciting emulation amongst native manufacturers, and appealing to their pride, they had been prevailed upon to send specimens of their workmanship from far and near. In the outset this exhibition was called "a fair:" but the importance given to it by the universal encouragement with which its establishment was met, soon gave it the complexion of a thoroughly national undertaking.

Suburban Artisan Schools.—One of the practical results to arise in this country from the Great Exhibition, will obviously be the extension of artisan schools of drawing and modelling; for it is certain that, with the extension of the art of design, improvement in execution must go hand in hand, or we shall in a few years be driven out of the ornamental market altogether, by our German as well as French rivals. Having this conviction, it is gratifying to know that the workmen themselves have much the same idea, and that they are anxious on their part to acquire the necessary knowledge if they find the means of doing so. The committee for establishing Suburban Artisan Schools opened rooms for the study of drawing and modelling, under the title of the "North London School," Camden Town, on the 1st of May, 1850. Since that time above 500 working men and lads have attended the school: the present winter-term has commenced with eighty male students, (one half of whom also attend a class of geometrical drawing), and nineteen female students, and these numbers are increasing weekly. The progress made is of the most gratifying character. So successful appears to have been the system adopted by the committee, and so encouraging its results, that they are anxious to extend their sphere of action, and establish schools in other parts of the metropolis.



THE AGRICULTURAL MACHINERY DEPARTMENT.

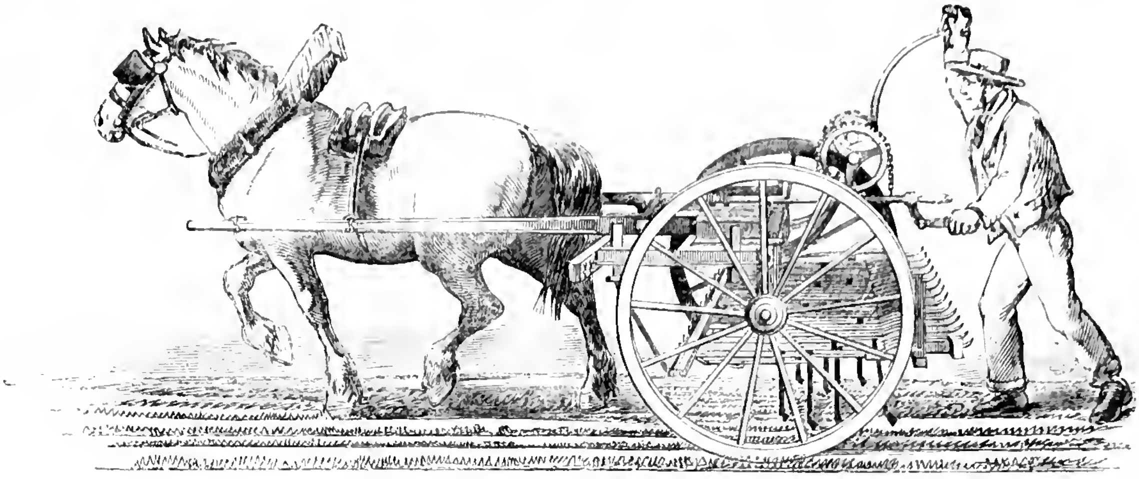
THE AGRICULTURAL MACHINEF DEPARTMENT.

THE Agricultural Department receiv throughout the whole period t Exhibition was open, a large amount attention from all classes, and especial from foreigners, numbers of whc might always be found examining wi great interest the details of the vario machines, and discussing their numero advantages. They have also given orde for an immense number of every descr tion. Nor have the English farme allowed so splendid an opportunity pass by of setting themselves up witl fresh stock of improved implemen one firm alone having received orde at their factory, since the opening the Exhibition, for 5000*l.* worth agricultural implements, to be execut similar to articles exhibited by them Hyde Park. But perhaps the m gratifying sight in visiting this cl was to watch the interest taken by t large number of agricultural labour in the immense variety of things he exhibited, and upon which they w well able to form opinions. To th men an exhibition of their own eve day working gear, of such variety, beau and ingenious design, must have bee great treat. Their masters have been the habit of seeing similar collections the annual agricultural shows; but t labourer, who seldom leaves the la on which he works, can have had t few opportunities of seeing more th the old fashioned implements of own locality; hence much of the absu prejudice so frequently found amc this class, but which this Exhibiti more than any other thing of this tin will tend to remove. Of the immer variety in the form of the tools he us he could previously have formed notion. There were a hundred ploug in this class, no two of which were p cisely alike. That a great change l of late taken place in the opinions a practice of the British farmer, the can be little doubt; for many of t ingenious contrivances (for their adva tage as well as that of the public) he exhibited, have been many years forcing their way with these practic men, who invariably have heretofore s their faces against them simply becau they were new. This is not the ca now; agricultural machinists are w supported by the farmers, who b immediately anything that is offered an improvement with a fair chance success. This is caused by their n being driven to study the principles the machines they use, and whi enables them to form better judgmen of what they should purchase.

One might often have observed ge tlemen from the country opening fi doors of engines, counting tubes, a discussing the relative merits of osc lating trunks or fixed cylinder engine in the most learned manner, of who very existence a short time since the were utterly ignorant. Let us ho these are some of the many benefits shall receive from the more enlighten policy now pursued in reference agriculture.

GARRETT'S PATENT HORSE HOE.

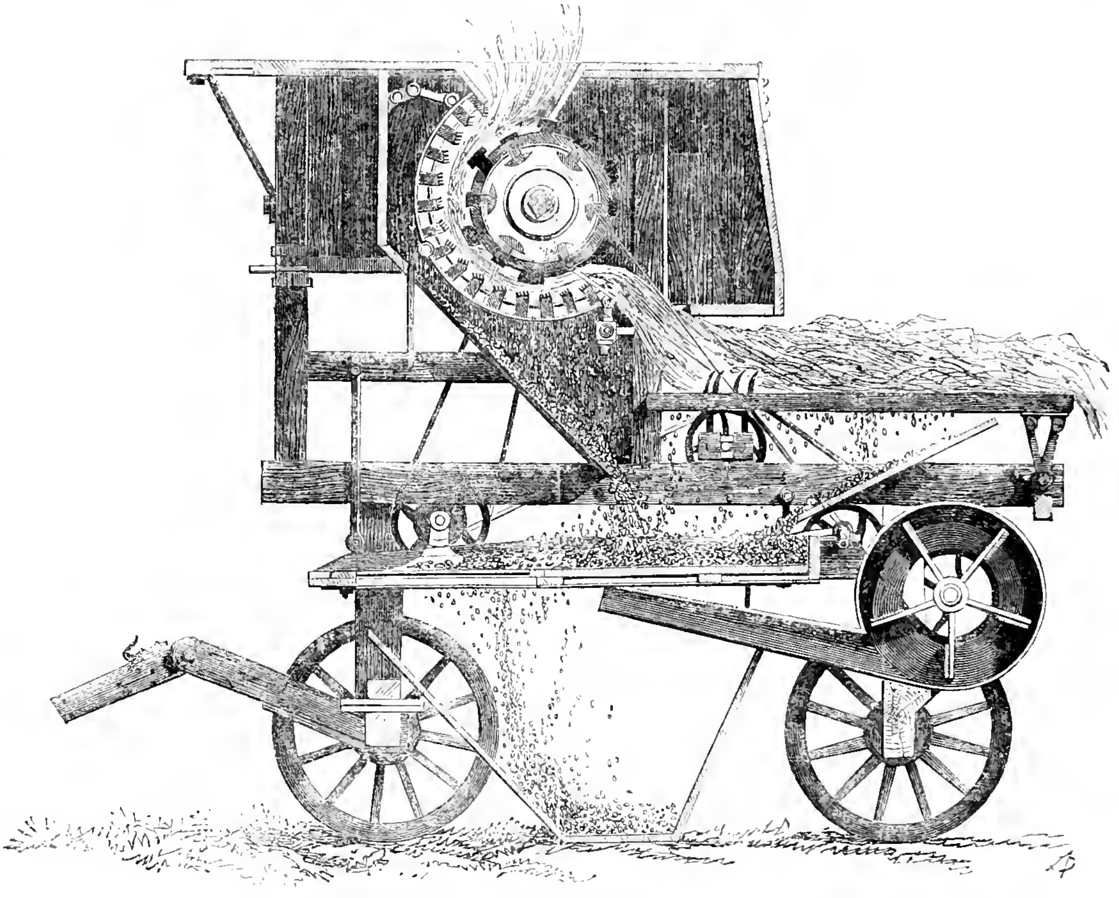
This implement is calculated to work an important improvement in field ltivation, as by its use, corn of all kinds, drilled in rows of not less than inches apart, may hoed in a superior nner at a cost not ceeding sixpence r acre. It is adapt- to all the prevail- g methods of drill lture, either for ansing crops drilled the surface or ridges, the axle- e of the wheels ing moveable at th ends, to suit the ried intervals be- een the rows of nts; and as each tting hoe works on ever, independently the others, the eds are effectually stroyed, however even the surface of ground, the hoes ing kept a uniform pth by means of gulating keys. The steerage forms a valuable feature of the implement, the hoes may thereby be guided with the greatest precision, perfectly eing the intervals without injury to the corn or plants. As much as m 10 to 15 acres per day may be hoed with one horse, a man, and a y. The horse hoe ers particular ad- ntages over hand ing, besides saving expense, as the rk may be per- med at the proper ne; and as the hoes netrate a greater pth, fresh life and our are given to owing plants, by ring the mould ound them.



GARRETT'S PATENT HORSE HOE.

RRETT'S IMPROVED RESHING MACHINE.

Threshing by ma- nery is now the dinary practice all er England; every ge farmer has one his own, and the aller holders hire for the time of sons who keep m for that purpose. e threshing ma- ne was originally ented in Scotland, Andrew Muckle, d was used there a considerable iod previous to introduction into gland. The Scotch ma- nes were, and are, ogether of a much msier and heavier cription than the glish, who have ch improved upon invention of ckle. The Scotch erally retain the ginal principle, ich consisted in holding the straw firmly between two rollers, while the corn s beaten or scutched out by a series of bars, fixed transversely upon a m, revolving with considerable velocity parallel with the feeding rollers, concave or breasting part having little to do with the actual threshing the corn. In the English machines, the concave is made to play the st important part, the straw being fed directly between the drum and concave, without the use of rollers, and in its passage through it is rubbed out, instead of being beaten out, as in the Scotch manner. The great objection to threshing by either of these machines has been the damage done to the straw by the action of the beaters, it being for some purposes, such as thatching, quite spoiled. To obviate this difficulty, Messrs. Garrett, of Leiston works, Saxmundham, Suffolk, have succeeded in bringing into general use the one called a "bolting machine." In this, the straw, instead of being fed in endways, as in all the old machines, is admitted lengthways, and, in consequence, is not bent or broken in the least by passing through. We are not quite sure whether the Messrs. Garrett were the original inventors of the bolting machine; but, certainly, they deserve the credit of having brought it into general use. The latest improvements added to their machine, as shown in our engraving, are, 1st, the improved form of the breasting or concave, and the manner of adjusting the same to the drum; 2nd, a straw shaker, which receives the straw after

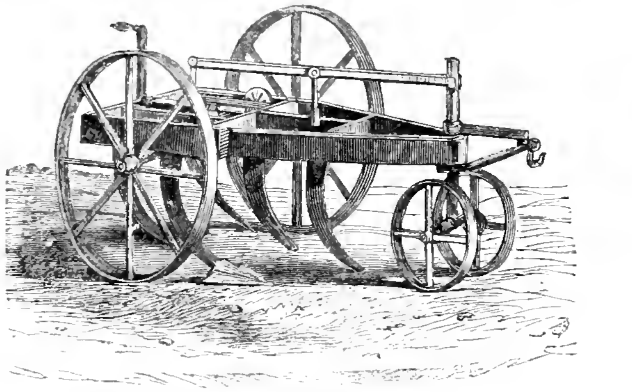


GARRETT'S IMPROVED THRESHING MACHINE.

it has passed through the machine, and clears it of all loose kernels that may be amongst it; 3rd, a vibrating screen for separating the loose ears, short straws, caving, &c., from amongst the corn and light chaff, the latter being driven off by a blast fan while the corn is passing over the screen. After the corn has passed the various processes above described, it will be found free from all chaff and rubbish, and, once passing through a dressing machine, it will be fit for the market.

LORD DUCIE'S CULTIVATOR.

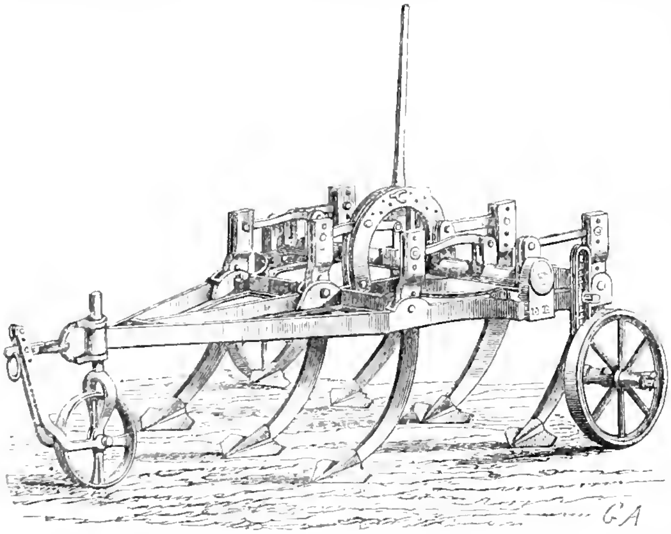
The introduction of this implement was a great boon to agriculturists, it enabling them to adopt a much higher state of cultivation at the same cost, as its strength and excellent action render it nearly equal to a second



ploughing, while the labour attending it is no more than one-third. It is in this peculiarity that it differs from machines of a similar description that preceded it: they all partook too much of the mere harrow character, and had no claims such as Lord Ducie's has to be called a cultivator. Their action was almost entirely confined to scratching on the surface, while the Uley implement disintegrates the soil to a considerable depth, and does actually in a short time, if constantly and properly used, quite change the character of the tilth. The mode in which it is raised out of the ground, and the plan by which its depth is regulated, was the invention of Mr. Clyburn, of the Uley works. The operation is performed with great ease, and the regularity and parallelism of the frame-work as it is raised or lowered is quite perfect. Our Engraving of this machine is as constructed by Messrs. Barrett and Exhall, of Reading.

COLMAN'S DRAG HARROW AND SCARIFIER.

This is a modification of the Ducie Cultivator, and is an excellent implement as a drag harrow and scarifier, eradicating all weeds and rubbish from



the foulest land: it is also efficient for opening, raising, and pulverising the soil: and with different blades fitted to the tines, it makes an excellent skim, to take off couch, &c.

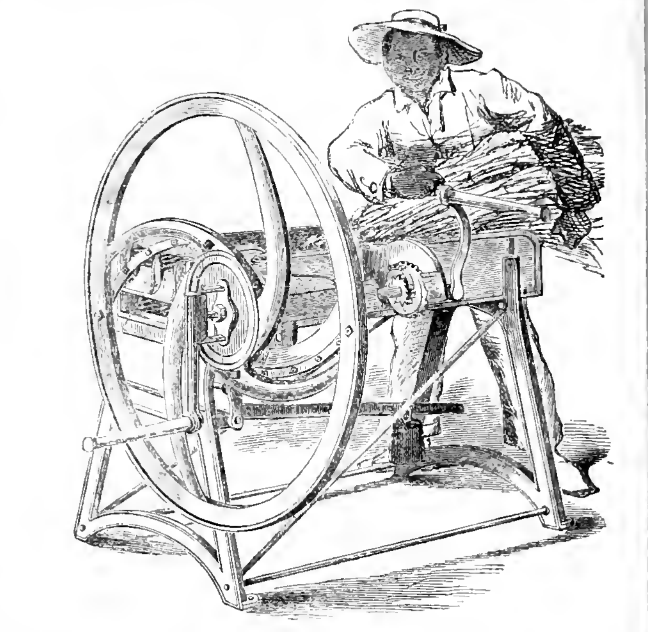
The principal novelty is in the frame at the top being suspended about six inches above the lower one, parallel with which, by means of a lever, it is moved backwards and forwards: this motion regulates the depth of the tine in the soil, without having to lift the frame of the machine, which remains always at the same height from the ground.

It is the invention of Mr. R. Colman, of Chelmsford, Essex, by whom they are manufactured.

RANSOME AND MAY'S CANE-TOP CUTTER.

This machine is one of a number of valuable implements introduced this eminent firm into the West Indies.

It is used for cutting cane-tops for cattle, and is in high repute there. has two knives, and cuts the cane into lengths of half an inch. It can



worked by one or two persons, and is constructed in the simplest poss manner, requiring no particular skill on the part of those who use it. made entirely of metal, to avoid the inconvenience and damage which o to machines constructed of timber.

ANIMAL AND VEGETABLE PHYSIOLOGY.

FOOD OF MAN.—No II.

Of all vegetable products, the root of the *potato* is the only one suit by itself for the maintenance of life. It contains starch for purpose of making fat and keeping up the heat of the body; gluten, w is a nitrogenised substance, and capable of affording muscular stren iron, for the blood; phosphorus, for the brain; citric acid, to pre scurvy. The fault which is found with it as an aliment is the low am of the gluten; and hence, practically, the Irish remedy the defect by use of skim-milk, which contains abundance of that material. At Crystal Palace we had dried slices of potatoes; we had potatoes prese in tin; we had models of the principal varieties grown in Scotland, we had what is called potato-flour. The latter, we believe, is merely starchy matter, and therefore has not the nutritive properties of entire potato. The potato tubers must not be confounded with the s potato, a model of which was exhibited in Messrs. Lawson's collecti This latter plant is a totally different kind of plant; and from trials w we have made under the most favourable circumstances, will not f tubers in England. It is very analogous to the root of the yam, so m used in the West Indies. Both, when baked, give a white floury prod which we find, when mixed with a certain portion of flour, can be m into good bread. The Irishman will eat from 6 lb. to 12 lb. of potatoes a

Of all vegetable products, *wheat* is regarded as the most import It contains, in a very concentrated form, the materials which are neces for the human organisation. It has been cultivated for so long a per that we know not the wild plant whence it proceeded, and yet, neverthe it requires much preparation to render it fit for food. The grain i consists principally of three parts—the lignine or woody case, which g it its general form, and which is separated in the form of bran and poll the starch and vegetable gluten, which exist in the flour and give to i nutritive properties. It moreover contains phosphorus in a state p liarly adapted for assimilation. Our first millers consider that the fl when too highly sifted, is not so nutritive as that which is rather coa because, by continually sifting it, little more than starch granules

ft. A large manufacturer of the metropolis required a peculiar operation, volving great labour, to be performed by one man. He tried successively to powerful-looking Irish, the tall north country and west country men, ut all were obliged to abandon it except those whom he procured from the stern counties, and had had the advantage of full diet and good wheaten read—a fact which well shows the necessity of feeding the people.

Of wheat itself, we have specimens from all parts of the world. Our wn country has shown most excellent examples. Canada also contributes s portion. From Russia, the examples are splendid. America is great in is matter. Egypt, which has grown grain from the time of the Pharaohs, ters into competition by contributing its examples. Portugal, Spain, d, in fact, nearly every department, has sent some specimens to the orld's Fair; and many different kinds cultivated might be seen at Mr. wson's stall, or at the table of Mr. Gibbs, where their arrangement was t very good.

Oats, as an article of food is next in importance to wheat. Some were nt from the Royal Farm; and, in fact, abundance of specimens were sent om most parts of the world. Oats contain more nitrogenised matter an barley, and less than wheat; and thus, next to wheat, it is the most portant grain which is grown. Oat cakes were exhibited by Messrs. wson; and Mr. Smith exhibited oaten flour prepared by a patent ocess.

Chemists find that *barley* is greatly inferior to oats. It contains more archy matter and less nitrogenised compound. Hence it is well adapted r fattening poultry. At the Exhibition it was represented, as well as oats d wheat, in many departments.

Indian corn was exhibited in the American department, of the first cellence. This vegetable substance came to aid during the famine in eland, but as an ordinary article of food it is greatly inferior to wheat. contains less gluten than wheat, and is not therefore so sustaining. dian corn has not proved a profitable crop in England, and though veral kinds may be grown and will yield a small crop, it does not pear to be profitable to the farmer. Mr. Keene has shown his forty-day aize from the Pyrenees, which is the best adapted variety for the English mate. The small maize from Lower Egypt is very curious and well serves attention.

According to those who estimate the value of food solely by the quantity nitrogen it contains, the *leguminous seeds* would appear to hold the first ace, for peas, beans and lentils, abound in nitrogenised products. In actice, the surgeon is aware that none of them are to be compared with other vegetable substances which yield gluten, and there appears to be great difficulty in their perfect digestion. The French showed many ckets of preserved green peas, in canisters; and upon the whole subject, hilst admitting the excellence of green peas and young broad beans, and ly extolling the French and scarlet beans as employed as a vegetable, d having no objectioin to pea-soup on a cold winter's day, yet, as an linary article of nutrition, we have a very low opinion of leguminous atters, and do not, even from our experience, consider that they can safely employed to any extent. They contain little or no phosphorus, hich places them in a powerful contrast with the potato in this respect. rkey sent a great many lentils, and from the Royal Farm of Windsor ub of beans was sent.

Rice was shown from almost every country in which it thrives. We have d the curiosity to grow it in a hothouse in this country; but even there ill suits our short summers. It is a vegetable product which, from its aplicity and pleasant flavour, it is almost impossible to get tired of. It y be cooked in many different ways, and in all it is remarkable for its gestibility. Indeed, we consider it to be the quickest, or one of the ickest, digestible substances which has been discovered for food. Some ars ago there was a great prejudice against its employment by the poor, d even now it is not nearly so much used as it ought to be. It contains re starch and less gluten than wheat and some other grains, and hence, itself, would be but a poor food, as it would hardly supply sufficient scular energy. We have observed that people are really themselves st excellent judges of the effective power which they obtain from various ds, and perhaps they have not found it go so far, for its price, as tatoes or good wheaten bread.

Mr. M'Callum sent specimens of the creeping stem of the *Typha latifolia*, or large red mace, which is said to yield a meal fit for food, and pplies a fibre which can be adapted for various manufacturing purposes. various roots used for food, we have the parsnep represented by a model. forms a nutritious substance, and can be mixed with bread. The carrot far less digestible than the parsnep. Turnips, as far as we know, are ply shown by a model. They form a nutritious food if taken in suffint quantity, but will not answer for the poor at London prices. They y be made, with a certain proportion of wheat flour, into bread. Jeruem artichokes are not much used, and then are employed more as a ury on the table of the rich. They are also represented by a model. ongst the roots, Messrs. Lawson have shown the *Apios tuberosa*, proposed a substitute for the potato; but it appears, even if wholesome, which is btful, that it yields but very small produce.

The *Coffee Berry* is shown from various parts of the world. It is the duce of a handsome shrub, which may be seen at Kew, or, in fact, at ny of the nursery-grounds. It is roasted and ground before it is used food. On the 1st of May one of the Turkish superintendents was laining to a number of ladies the use of a set of coffee utensils used by m. He told them "that they must excuse him, but the English ladies did not know how to make good coffee. His countrymen used boiling water, and threw the coffee into it, and when it had twice risen it was ready for use." Upon interrogation he appeared to set little store upon its clearness, so we are afraid that his excellent coffee would not meet with much favour at a West end dinner party. The powers of coffee over the brain and nervous system are sufficiently well marked; and perhaps the public should know that in the strongest coffee they have a powerful remedy at hand to resuscitate persons who are suffering from immoderate drinking, or too free use of opium. In the North-west Gallery the public may have observed several fine specimens of theine and caffeine, and one which deserves investigation. It is stated by Dr. Gardner to be made from the coffee leaves, roasted specimens of which are displayed. We took two or three leaves from our coffee plant and roasted them, and tasted the infusion. In our judgment the experiment did not appear to be promising, yet we should be sorry to dismiss the question of their utility in so summary a manner, and should be delighted if Dr. Gardner could prove that the leaves will add to the comforts of the poor. Connected with coffee, we may state that Mr. Snowden has shown samples of cleansing and purifying the coffee berry previous to roasting and grinding.

Messrs. Saunders and Gatchill have shown *Chicory* in all its stages. This detestable stuff is principally used by dishonest traders for the purpose of making the public believe that they sell cheaper than their neighbours. It is the dried root of the wild endive which is employed, and is now much grown in England, France, Germany, &c. There is an impost duty on the foreign produce, whilst that grown in England is not subject to the excise laws. For this reason the vendor gets the whole benefit of the impost; and as the farmers are always screwed to the payment of the highest rent which they can bear, the landlord gets the ultimate benefit of its sale. The use of this nasty adulterative is so extensive, that chicory itself is now enormously adulterated by various other roasted substances, and, whilst landowners are benefited thereby, there is no immediate prospect of any abatement of the nuisance, unless, indeed, the publication of the name of the dishonest trader by the *Lancet* shall induce the public to leave the shops of all those who thus cheat their customers.

It is a curious fact that both *Tea* and *Coffee* owe their properties to the presence of the same alkaloid, as *theine* and *caffeine* are identical in composition, and are highly nitrogenised products. The delight which English people take in tea and coffee renders both important articles of commerce, and both are well represented. In the Chinese department our readers had an opportunity of inspecting drawings of the different processes employed in the manufacture of tea, from the planting of the seed to the packing of the chests, together with a very extensive series of genuine and factitious teas of every class. The green tea and black tea are different plants, as may be seen at Messrs. Loddige's, Kew Gardens, and even in other nursery-grounds. The Assam Tea Company contributed various samples of tea as cultivated by them in India, and which have at any rate a very excellent appearance. The exact operation of tea on the system is not known, but it is manifest it exercises considerable influence over the functions of the nervous system. Some persons cannot sleep a wink after a cup of strong tea, and there can be no question that it supports, in other instances, the action of the brain, and takes off the sense of fatigue. It has also a direct and powerful influence in promoting the secretion of bile; and, in conjunction with vegetable food, is found to improve the nutritive qualities of the latter. The immoderate use of this beverage destroys the tone of the stomach, and predisposes to cramp.

Chocolate is a vegetable food not nearly as much used in England as in neighbouring countries. It is prepared from the nut of the chocolate tree, which may be seen at Kew Gardens in high perfection. Messrs. Fry and Son, of Bristol, have sent specimens of the leaves, flowers, and branches of the tree which yields the nuts. The nut consists of a large quantity of oily matter, and a nitrogenised principle very similar to theine. Amongst the machines in motion, a model of an apparatus for grinding and preparing it was shown, and those who walk down Holborn may see the real apparatus in action. The French, and most foreigners, make numerous bonbons of this material.

The Paris company sent many specimens of chocolate, mixed with various materials. Some are flavoured with vanilla, the seed-pod of a species of orchid, which was shown lately at the Botanic Gardens in the fresh state, and was also exhibited in the Crystal Palace, in the department for the colonies, and also in several chocolate cases, in the dried state.

We suppose that we must class *tobacco* amongst articles of food. It is procured, as our readers know, from a plant which grows freely in our gardens, but which does not yield so potential a product. Perhaps, those who employ this weed are but little aware how poisonous is the substance with which they are dealing, as a very small quantity of the essential oil will destroy life if taken into the stomach; and it is so powerful and uncertain a remedy, that but very few medical men dare to employ it. It is used, nevertheless, in three ways—either as a substance to be chewed, a powder to be snuffed up the nose, or the vapour which is inhaled during burning is allowed to come in contact with the mucous membrane of the mouth and fauces. The use of it is said to destroy the sense of hunger under intense fatigue, and to serve as a stimulus to the nervous system.

From the above account, our readers cannot fail to observe that the number of vegetal substances, used for food have been abundantly represented; and, besides these, we shall hereafter have to describe numerous fruits and vegetable products which have also been contributed, the whole question of food having been largely represented.

GROUP OF GLASS.—J. GREEN.

THE group of glass by Green, of St. James's-street, represented at the head of the present page, contains some very admirable examples of the improved taste and skill of our workmen in the art of engraving glass. The designs exhibited by this house are in a variety of styles: some after Greek, Egyptian, and Etruscan models; others copying the national emblems, national flowers, &c.

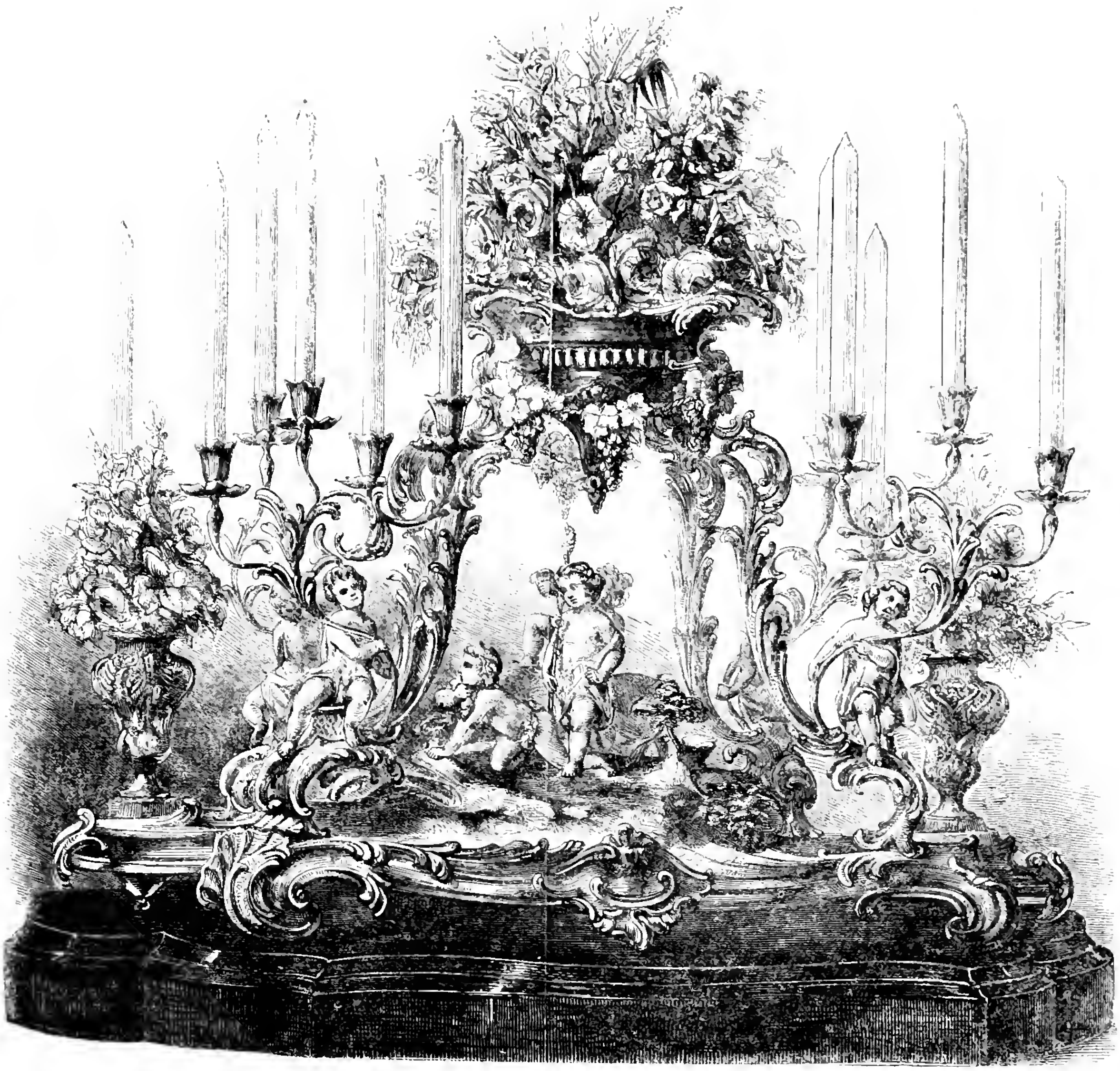
Bell's "Dorothea," and Kirk's group of "The Origin of the Dimple," are two very pleasing works in the romantic or fanciful school. Those who remember the story of Cervantes' heroine, (who, by the way, we submit is entitled to "honorable mention," as the first "Bloomer") will recognise the tasteful spirit in which she has been treated by Mr. Bell. "The Origin of the Dimple" speaks for itself.

DOROTHEA.—BELL.

THE ORIGIN OF THE DIMPLE.—KIRK.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.



CENTRE-PIECE.—MOREL, NEW BOND STREET. (See Page 130.)

THE GREAT EXHIBITION AWARDS.

HOSE who in after years may turn to the record of the honours lately distributed amongst the Exhibitors of All Nations, in the expectation t it will present a fair reflex of the position of industry and the attainnts of science in 1851, will be grievously disappointed. The very reading the list, indeed, would convince them that there was something wanting, d that the commercial greatness of an age like the present could not ve been dependent, to any great extent, upon trivialities such as those to which the juries have awarded prizes. The reports of the juries, which we are promised shortly, will, perhaps, throw light upon the intentions with which many of these awards were made, and which, without such explanation, appear to be capricious and altogether inconsistent with any practically useful purpose. In the mean time we pursue our comments upon the decisions as they stand, which bear upon their face circumstances of a suspicious or questionable character.

Passing over Classes I. and II., which we may attend to another time

we come to Class III., that of "Substances used as Food," in which we find two council medals, and no less than ten prize medals, awarded to different individuals for beet-root sugars. The two council medals go to France, and the prize medals are thus distributed:—France, 3; Austria, 5; Prussia, 1; Russia, 1. Now, considering the history and circumstances of this manufacture; considering that it is purely factitious in origin, and only supported in the countries where it is carried on by high protective duties; considering that the declared object with which this manufacture was first established in France by Napoleon was to injure the British colonial trade, and that the undisguised object with which it is still encouraged in Austria, in Prussia, and in Russia, is to render the people of those nations as independent as possible of British supplies, and, in short, to exclude us from commercial relations; considering that all this is at variance with the true and enlightened principles of commerce, which are a distinguishing feature of the present age, we are justified in pointing to these awards as extremely unfortunate in themselves, and can only account for their being made by referring to the fact of that combination of foreign "interests" which the Commissioners went out of their way to introduce into their jury scheme.

As the introduction of the manufacture of beet-root sugar into this country, and more particularly into Ireland, is a question which has been much discussed lately, and as the awarding of no less than twelve prizes to the producers of this article is likely to have some influence in promoting projects of this sort, we think it right to direct the attention of our readers to a paper read by Professor Hancock, at the last meeting of the British Association, on the "Prospects of the Beet Sugar Manufacture in England" from which it appears that, in a commercial point of view, the profitable result of such a speculation is very questionable, the case of France, with a protected and exclusive trade, not applying here. From these calculations it would seem probable that, taking into account the cost of the raw material, and the price of the refined sugar, in France and the United Kingdom respectively, "the result was so varied as to turn a profit of 35,000*l.*, at the French prices, on a capital of 78,000*l.*, into a loss of 4000*l.* at the Irish prices, and a loss of 16,000*l.* at the Essex prices;" being only one instance out of many "showing how fallacious it must be to reason from the success of the manufacture in France to its success in the United Kingdom, without taking into account the difference in economic conditions (including fiscal arrangements) between the two countries; being alone sufficient to make that which was profitable in France unprofitable here."

Dismissing the subject of beet sugar for the present, we cannot help expressing a confident hope that the introduction of this fabricated production as a substitute for the genuine article may be rendered still more unnecessary by the removal of the absurd restrictions now imposed upon the refiners of cane sugar.

In Class IV., whilst we cordially approve of the justness of the award of a council medal to the Belfast Flax Improvement Society, for "the persevering and successful efforts to improve the quality of the fibre of flax," we cannot but regret that Chevalier Claussen was denied the same honour for his ingenious and truly scientific process of preparing flax and flax cotton, whereby the value of that staple will be greatly enhanced, and its applicability to manufacturing processes largely extended. The details of this process have been already explained at some length in the columns of this Journal; it may be sufficient, therefore, to state here its principal features, whereby, as will appear, that not only a new process is applied to an end previously attained by other processes, but new and valuable characteristics are given to the article itself which it was before considered not to be capable of. We should observe that the principal process is purely a chemical one—the flax being first saturated with a solution of soda, by which the gluten is removed; it is then soaked in dilute acid, whereupon the chemical combination, resulting in effervescence, separates the fibre, and converts it into a cotton-like substance. One important advantage resulting from this alteration in the character of the material is, that, instead of the hardness and coolness generally observable in linens, it will possess the warmth of woollens, the softness of cotton, and the glossiness of silk; and another and still more important advantage is, that it becomes, which it was not before, amenable to the ordinary processes of manufacture, and by the very same machinery as that applied to cotton itself. Such are the main features of this important invention; and, after considering them, we feel satisfied that our readers will agree with us that it was a mockery of justice to withhold from the ingenious originator the "council medal," and to add the insult of tendering a second-class prize medal. Yet such has been done; and, in common with many others similarly treated, but who have not half his grounds of complaint, the Chevalier Claussen has very properly rejected the proffered distinction.

In the machinery department we find a council medal awarded to Appold's rotary pump, whose voluminous cascade most of our readers recollect gazing on with admiration. But surely there is nothing very new in the rotary principle applied to pumping up water, and nothing so remarkably superior in the machinery of Appold (amongst many others exhibited) to entitle it to the distinction here intended. There is, indeed, considerable doubt whether Appold's is, after all, the best of the day; and this is a question which we may yet have to discuss. But, if the application of the rotary principle to water was neither new nor very important, its application to machinery has long been an acknowledged desideratum, but one involving a problem of the greatest difficulty. This desideratum, however, has been accomplished in connexion with one very valuable field of mechanical appliance—namely, that of the printing press, by Mr. Applegath, in his vertical printing-machine, a machine by which the limit of production have been extended half a dozen fold beyond what they ha[d] previously reached under the most skilful manifestations of reciprocatin[g] machinery; the contrivances by which this was attained were in the highes[t] degree complicated, but withal unerringly accurate; and all that Mr Applegath was awarded for his invention is a common prize medal. Th[e] thousands of eager spectators who daily crowded about this machine, whe[n] in operation at the Crystal Palace will form an estimate of the profoun[d] and dispassionate judgment brought to bear by the jurors from this singl[e] award alone.

If we were to judge of the amount of enterprise bestowed upon "civ[il] engineering, architectural and building contrivances," or the amount [of] interest taken by the community in such subjects, by the awards in Cla[ss] VII., we should not arrive at a conclusion very complimentary to th[e] genius of the age. There are in all only three council medals and twent[y-] three prize medals earned by the whole body of exhibitors to this compr[e]hensive department; and these are chiefly for models of works long sin[ce] accomplished, as the Plymouth Breakwater, Strasburg Cathedral, th[e] cast-iron bridge over the Wye, &c., or for topographical models of vario[us] districts, as the Isle of Wight, &c. As for our architects, they appear [to] have been completely disheartened or paralysed by the brilliant success [of] the Crystal Palace style of building, for they have not sent in a sing[le] suggestion considered worthy of reward; and of the three council meda[ls,] Sir J. Paxton and Sir C. Fox receive two, the one for "the design of t[he] great Building," the other "for the execution." The third is very just[ly] awarded to Prince Albert, for his successful labours in the cause [of] humanity, which have resulted in the production of his model lodgi[ng] house, one of the very few contributions tending to the improvement [of] the social and economic relations of the masses, which the Great Exhibiti[on] has been the means of bringing before the world.

The preceding observations have chiefly been directed to general co[n]siderations involved in the scheme of awards in certain classes, or [to] particular instances; and we wish we could continue to argue in the sa[me] spirit, and to stand aloof from mere questions of individual merit, a[nd] private interests, affected by these decisions. But it is impossible to [do] so; the complaints of injustice and the charges of favouritism and incom[pe]tence against, not one, but various juries and groups are so loud a[nd] circumstantial that we feel bound to give them a hearing. Of course, [with] all this outcry are mingled the small shrill voices of many a little pretend[er] who, but for this confessed and wholesale blundering of the juries, wou[ld] never have been heard of, and who has now the proud privilege of be[ing] "an ill-used man," in company with such names as those of Broadwo[od,] Collards, Troughton and Simms, Claussen, Potts, Copeland, &c. At [the] same time, even these were entitled to a hearing on the trial of their fanc[ied] merits; and it is very hard that, being personally excluded from [the] Building by the niggardly parsimony of the Executive, they should h[ave] been prevented the only direct method of securing such hearing. In t[his] dilemma many of the "ill-used" entrusted the keys of the cases wh[ich] inclosed their several treasures to the policemen in attendance, in [the] confiding hope that some plodding juryman, attracted by the outw[ard] promise of the imprisoned exhibit, would honour it with closer inspecti[on,] and reveal its merit to his fellows in "the group." Vain delusion! [In] very numerous instances which have come well authenticated to [our] knowledge, the keys remained very snugly in the pockets of the pol[ice.] "Hope deferred" had at last begun to wear itself out, and as the Exhibit[ion] drew towards its close, many of the non-examined were fain to look to [the] "chapter of accidents" for their chance of sharing in the honours of [the] day, or at least comforted themselves with the reflection that others, ri[vals] in their trade, might be wholly overlooked as well as themselves. Wh[en,] however, it appeared that non-inspection of the goods was no bar to [an] award, and that the rival producer carried off the palm in competition w[ith] others whose goods positively remained uninspected during the whole [six] months, the outcry was loud and bitter, and, what is more, was just; [for] these complaints remaining uncontradicted and unexplained, involve [a] serious and damaging imputation against all engaged in making such awa[rds.]
—*Illustrated London News.*

SILVER CENTRE-PIECE. BY MOREL.

THE Illustration on our front page represents a very beautiful Centre-pi[ece] by Messrs. Morel, of New Burlington-street, and which may be pronounce[d to] have been one of the happiest works of its class in the Exhibition. It is in [the] Louis Quatorze style—the subject a triumphal procession of Cupids w[ith] a panther. The little fellows exhibit varied, but appropriate attitude[s,] those at the corners guiding, rather than absolutely supporting, the branc[hes] which hold the candles on either side. In the centre, crowning all, i[s a] magnificent bouquet of flowers.

EARLY USE OF STEAM.—William of Malmesbury declares of Pope Sylves[ter] II., that he erected an organ which was played by steam; and, though [we] cannot rely very implicitly on the authority of this most credulous [his]torian, the anecdote deserves to be noticed, as a proof that the use of ste[am] as a motive power was partially known, or at least suspected, as early [as] the eleventh century.—*Taylor's Revolutions of Europe.*

DWELLINGS OF THE LABOURING CLASSES.

THE General Board of Health lately issued a notification making known, and calling for the execution of, legislative provisions affecting much larger numbers of the population, and to a much more important extent, than the public are probably aware of. It announces to the poorer classes, that by the provisions of the Public Health Act it is illegal to immure them in cellar dwellings which have not a proper construction and arrangements for comfort and decency. The owners of the greater proportion of cellar dwellings in the metropolis, such as those in Monmouth street, St. Giles's, and great numbers of other districts to the east end of London, will have to give up their inhabitants, and apply the space to other uses. In the provincial cities and towns great numbers of the population are affected by the provisions. It is said as many as eighteen thousand at Manchester, nearly five thousand at Bolton, between two and three thousand at Preston, and at Liverpool upwards of thirty thousand of the population, have, under the provisions consequent upon the revelations of the sanitary report, been already under process of ejectment: but this has been done by the corporation in such a manner as to aggravate the evil by overcrowding the upper rooms, after that effect had been pointed out in the report referred to, as the consequence of some of the improvements of the corporation of the city of London. In the "clearances" of poor dwellings for the formation of Farringdon Market, the like effect has indeed followed. During the "clearances" for the improvement of St. Giles's, the ejected population was "wedged in," upon the overcrowded population in such places as Church-lane, and the lower districts of Westminster.

The Board's instructional notification announces, that now, by the act passed during the last session, at the instance of the acting chairman, Lord Shaftesbury, the administrators of the law for the discontinuance of cellar dwellings are relieved from the alternative which pressed against its execution. Every new local board of health, all corporations, and parishes even, may, under the act to encourage the construction of "well-ordered lodging houses for the labouring classes," provide suitable accommodation for the population ejected. Prince Albert took the lead in showing, by the model buildings which he erected at his own expense, that it was possible to build dwellings of superior sanitary construction, drier, warmer, and provided with decencies, at half the rents exacted for the wretched fever nests and pauper warrens which have too many defenders in public positions. The interest taken in the Prince's model dwellings is shown by the fact that, although they were only opened some time after the commencement of the Great Exposition, and when attention was absorbed by it, upwards of 300,000 persons went to examine the cottages. The impulse has been manifested in various directions. The London Dock Company has already erected a large number of dwellings for their workpeople, with the improved appliances for decency and cleanliness recommended in the sanitary report. Every dwelling has a water-closet and a water supply, and tubular drains, and means of ventilation. Several large landowners are beginning the construction of superior tenements in considerable numbers. The Duke of Bedford has already erected a great number of new dwellings for labourers, of a very superior construction. The Duke of Northumberland has, we are informed, given orders for the construction of no less than 1,000 new labourers' dwellings; and due attention will, no doubt, be paid to the sanitary principles of their construction, in which architects and common builders have hitherto shown themselves grossly ignorant. Preparations are, we understand, made for the construction of a great number of dwellings on the same principle as those of the Prince's, so soon as tradesmen will charge less exorbitantly for the hollow bricks, or that the new and increased demand meets with a supply at reasonable rates. The public will be well inclined to forget, in the vote of the Common Council of the City Corporation of forty thousand pounds for the construction of model lodging-houses for the labouring classes, their vehement denials of the truth of the statements of the Health of Towns Association, as to the horrible condition of the inhabitants of the courts and alleys within their jurisdiction.

To the evidence adduced by the notification of the entire absence of epidemic disease in the new model dwellings in the metropolis, and the high average rate of health maintained there, we may add a fact in relation to the model dwellings at St. Pancras. A young apothecary, seeing a population of so many families, comprising as many as 550 individuals, made sure that there was, on the ordinary average of sickness out of such a number, a living for him, and he opened a shop there. But as imperfect as the sanitary improvements yet were, they proved too much for him; he got tired of waiting for the sickness which did not come, and he sold his chance of practice to a second, who was not aware of the new condition of things. This second, after waiting a length of time, struck his flag—his red bottle: he could find no customer for his practice, and decamped, and the apothecary's shop is now converted into a provision shop, which we hope will thrive.

More yet must be done, however, beyond all the present promise of increased household accommodation, which can only check the evil. With all the past and present drain of population, we must remember that the rate of increase of the population of Great Britain, and mainly of the town population, is as if we had two new towns equal to Manchester and Birmingham annually added to it, or the population of one whole new county equal to the county of Worcester or the West Riding of Yorkshire.

FOREIGN AND COLONIAL DEPARTMENTS

BELGIUM.

THE produce of the little constitutional kingdom of Belgium was exhibited next to that of France, occupying the bays on both sides, and a slice of the northern galleries of the Eastern Nave. It included specimens of almost every branch of industrial occupation: agriculture, commerce, manufactures, mining, and fine arts, in many subdivisions, are all represented in a very creditable manner. Belgium, under different names, has contrived to maintain a manufacturing and agricultural position for more than four hundred years, in spite of wars of which it has been the battle-field, of revolutions, of parcellings of territory, and changes of government, until, twenty-one years ago, at a fearful sacrifice of material wealth, it settled down as an independent state under a limited monarchy.

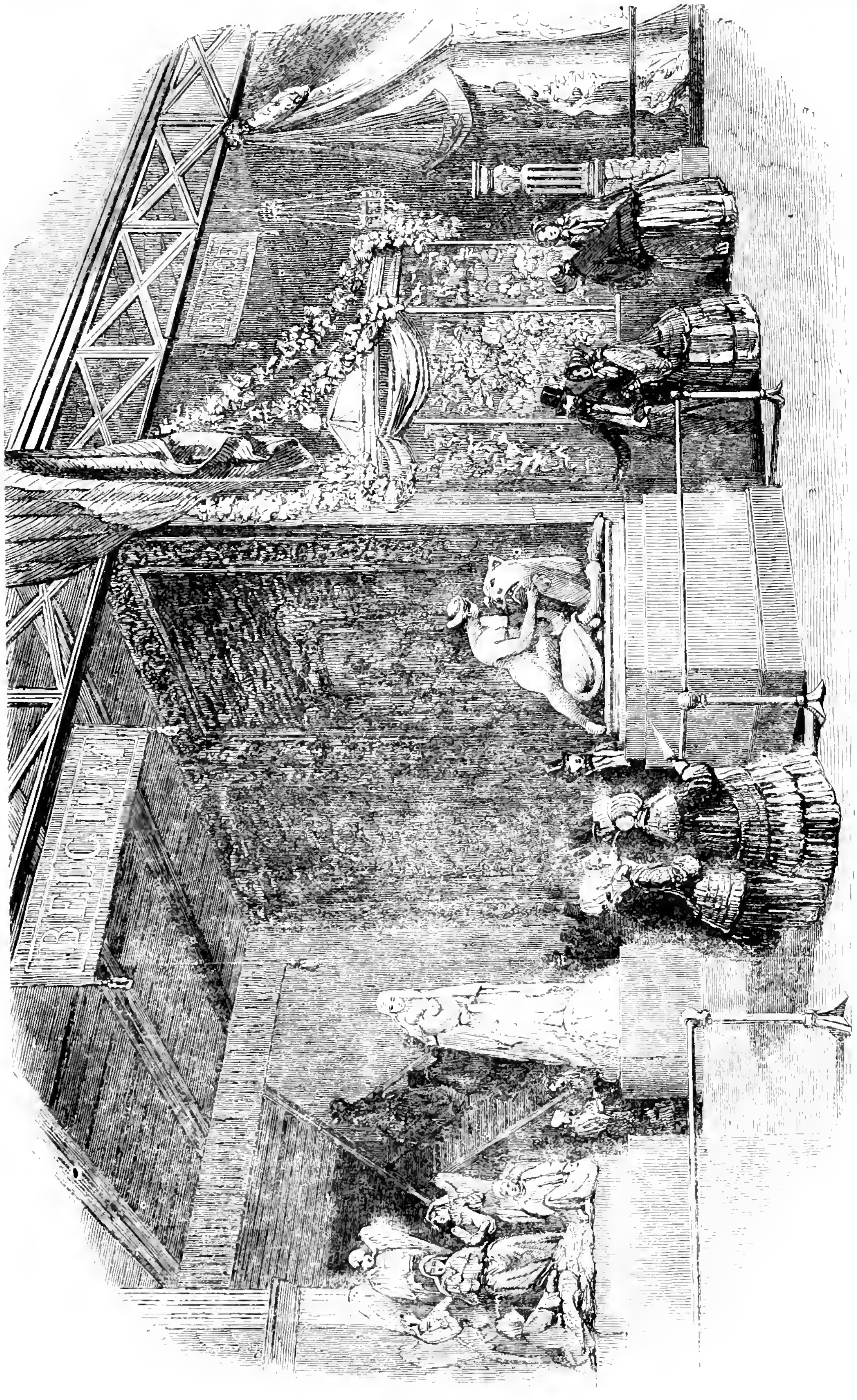
Even in the time of the Romans, the Flemish cities were celebrated for their woollen cloths. In the time of Charlemagne, Liége largely manufactured both woollens and linens; therefore, the flax cultivation, which forms so important a part of Belgian agriculture, must have been extensively carried on at that period. In the latter part of the fifteenth century, Brussels, Antwerp, Louvain, and Ghent, employed an immense population in woollen manufactures: Ghent alone had upwards of thirty thousand looms: the weavers of that city once mustered 16,000 men in arms under the banners of their trades. Thread lace originated in Flanders, at Mechlin and Brussels, where it is still an important branch of commerce, and the capture of Antwerp by the Duke of Parma, in 1785, ruined great silk manufactures—although Antwerp black silk is still famous—and drove a number of artisans to England, by whom our own manufactures were greatly improved. Flanders suffered grievously under the persecution of its Spanish masters; under the wars of Marlborough and Louis XIV. and XV.; the wars of the French Revolution, which ended in incorporating what is now called Belgium with France; the wars of Napoleon, which ended in taking it from France to add to Holland; and finally by revolution, which deprived the Belgian manufacturers of a large share of the commerce and consumption of Holland. But still the people struggled on with a patience and industry deserving of success. Belgium was thus thrown upon its own resources, as a manufacturing country, with only forty miles of coast and two indifferent ports. Great efforts were made to open up foreign trade; consuls were appointed all over the world, rather as commercial travellers to create, than as diplomatic agents to protect trade already existing; and public money was largely and not very successfully invested in propping up establishments in which the King of Holland had taken a large pecuniary interest. But the wisest and most successful step of all, was the construction, long before any other continental state had ventured upon such a novelty, of a complete network of railways. These railways, among more solid advantages, made Belgium the high-road to the Rhine and Germany, and attracted a share of the travellers to the pretty miniature capital of Brussels, who had formerly flocked to Paris alone. These railways, no doubt, contributed powerfully to raise Belgium from the state of depression into which its manufacturing interests fell after the separation from Holland, and, by cheapening the cost of raw and manufactured produce, to render possible the varied exhibition we have had the pleasure of examining.

The arrangement which rendered France and Belgium next-door neighbours in the Crystal Palace, as they are when at home, suggests a question which the Ministers of Commerce would be rather puzzled, we think, to answer.

Between France and Belgium there is a war of custom-houses and an interchange of smugglers, chiefly in the shape of large dogs, which carry Belgian tobacco and lace into France, and bring back French silk or some such article. Every French *douanier* is provided with a thick volume of instructions on the art of stopping, seizing, detecting, poisoning, and shooting Belgian smuggler dogs. Nevertheless, day and night—especially at night—large packs of contraband hounds, heavily laden, rush past the bewildered officers.

Now, when Belgium was part of the French empire, its manufactures, its coal, its cattle, its corn, were all freely admitted into France; nothing was taxed, nothing was prohibited; since the disjunction everything that is not taxed is prohibited, and yet the line of division between the two countries is purely imaginary, and the people who, under Napoleon, were free to interchange their goods, must have had just the same wants the day after the custom-house division made it unlawful as the day before. Why, then, was interchange useful before Napoleon's last campaign, and baneful after his dethronement?

But to begin our walk through the Belgian territory in the Crystal Palace. We first entered the southern bay. There we found a varied display of textiles of every kind, which seemed very little visited by the curious crowd, although, no doubt, our manufacturers in the same line gave them a close examination. There we found the cheap mixed fabrics of woollen and cotton, the fine kerseymeres in which the Belgians can undersell our Gloucestershire and West of England men, also capital stout canvass and damask linen from districts of Flanders which grew flax and wove linen long before Belfast was founded; printed silk handkerchiefs in praise of which nothing can be said, and woollen shawls of very dull, dowdy



THE BELGIAN COURT.

patterns. In this department almost every kind of woollen and mixed woollen is to be found, including a lot of coloured flannels. The sides of the next section by the stairs leading to the gallery were hung with carpets from the Royal Belgian manufactory of Tournai, which, like the French Gobelins and Beauvais manufactories, is carried on with government money, as a school for the purpose of improving native taste. Having proceeded onward towards a formidable stand of arms, we passed between a collection of saddlery on one side and boots and shoes on the other. The saddlery was respectable, but would not stand comparison for a moment with either English or Irish work in finish. The same might be said of the harness. The buckles were very clumsy. The patent leather boots were as good as French, and probably cheaper; a pair of long boots in brown Russia leather, the sides of which come off like gaiters, were worthy of the notice of those who shoot in woodland and thick hedge countries.

Liège sent a most formidable collection of arms, of every kind and calibre. Liège is the only place which can compete with Birmingham in supplying cheap guns. The specimens sent included the most expensive and the commonest; the bright-barrelled musket and bayonet of the pattern made for Schleswig-Holstein, and the muskets with sword-bayonet affixed, which are used in almost every corps of the Belgian army and in our Engineer corps.

We observed, in one case in this division, a pair of rifles made after the Swiss fashion, over which a paper is affixed stating that one of the rifles, fired from a rest, at a mark 4 inches in diameter, at a distance of 110 yards, made ninety-five hits out of one hundred. We should like to see this done again, and to know whether more than one man could do the same feat in one day.

Behind the arms, next to the external wall of

the Palace, we found a very miscellaneous agricultural and mineral collection of specimens of flour, millstones, bristles, bricks, tobacco, flax and hemp, and the dried plants in seed, with all sorts of cereal grain, hops and malt, coal, iron, cannon, and agricultural implements, the fleeces of merinos and cocoons of silk-worms — giving a great idea of Belgian industry and versatility.

The coal reminds us of the difference between the tenure of English and of French and Belgian coal-mines. In England, if you find a coal-mine on your freehold, it is yours; in the other two countries, it is the property of the state; and in France, unless you happen to be a supporter of the government for the time being, you have no chance of obtaining leave to work it; when leave is granted, it is subject to a royalty to the government.

In Belgium, the government compels coal-owners to construct ladders by stages for the miners, men and *women*, to ascend and descend, instead of using a perpendicular shaft, with an arrangement of chains and pulleys. The Belgian government will not permit the lives of its subjects to be risked on the soundness of a rope or chain. The result is, that Belgian miners, carrying coal on their backs up a thousand steps of a set of ladders or stages, are never killed, though strains and ruptures are every-day occurrences. We prefer our system, with a little more care.

Having crossed the grand avenue, we found the northern Belgian bay, flanked by two carriages, which did very great credit to the coachmaker, Mr. Jones, of Brussels.

Furniture follows the carriages. We especially remarked a sofa and chairs gracefully carved in walnut, and covered with green velvet. In the opposite bay are two cabinets in oak, of great merit, especially one of a grave, ecclesiastical character, ornamented with figures of angels. Some pianos and boxes made from Spa wood, which has acquired a slaty ferruginous colour from the Spa waters, would form a good contrast with furniture of birds-eye maple or zebra wood. Near this is an extremely ingenious dumb-waiter, like a large paddle-wheel, the shelves of which always keep on a level. It would be very convenient in a library, for a student who had a good many large books of reference in use at the same time. The principle would be available on board ship, for glass or crockery ware, fixed by the feet to the shelves.

The Belgian machinery and agricultural implements are not to be treated lightly; therefore we shall, for the present, pass them by, observing, that the great establishment at Seraing for the manufacture of steam-engines and all kinds of machinery, which was founded by Cockerell, under the patronage of Napoleon, and afterwards supported with capital by the father of the late King of Holland, sent several specimens of heavy work of a creditable character. The pace approved on the Belgian railroads, viz., fifteen miles an hour and many stoppages, does not demand the flying engines we impatient Englishmen require. M. Presmany, writing his opinion of England in the Paris paper *La Patrie*, says, "An Englishman never saunters, but always rushes forward like a mad dog."

THE BOY WITH PUNCHINELLO.—SIMONIS.—(SEE P. 13[illegible].)

Before ascending to the galleries we would request our lady friends fond of gardening or poultry keeping, or, like good wives, in the habit of accompanying their husbands through the stables and byres, to look at the live stock, to examine a collection of wooden shoes of very pretty shapes, some provided with leather fastenings, which seemed to us better than the best kind of clogs for country use in muddy weather.

On arriving at the top of the stairs, the leading articles, as the drapers say, were three figures of life size, sent by a Belgian embroiderer of ecclesiastical robes, which he dressed in costumes much finer than anything to be seen at Madame Tussaud's. He began with the Archbishop of Paris, Affré, who was killed in the last revolution at the barricades, St. Carlo Borromeo, an Italian saint and archbishop, and our English Thomas à Becket. Subsequently to the opening, Fénélon, whose "Telemachus" has proved the penance of so many English school-boys, and rendered so many school-girls as inconsolable as Calypso, took the place of M. Affré, and the Italian priest had been superseded by another dignitary, the Archbishop of Mechlin, if we remember right, but Thomas à Becket remained to the last; although, for some reason or other, all three of these lay figures were provided with white gloves, instead of the purple gloves of the Bishop and the bright scarlet of the Cardinal. While examining the embroidery of these robes, which the maker warrants to wear a hundred years, and *then clean*, we found ourselves side by side with two gentlemen actually wearing the one *scarlet*, and the other *purple gloves*—such are the strange coincidences of the Exhibition! They were Cardinal Wiseman and one of his Bishops examining the costume of Thomas à Becket!

THE BOY WITH THE BROKEN DRUM.—SIMONIS.

In the same galleries we observed a case of medals, cameos, bronzes, a shield, dagger, and other ornaments richly chased in iron, all displaying very considerable taste and executive skill, and maintaining the character in the fine arts which Belgium has long deserved.

To own the truth, neither statuary, nor lay figures of archbishops, nor the large display of Roman Catholic works, nor anything connected with art, science, or literature, created half the sensation among the ladies, that was excited by the specimens of lace from Brussels, Mechlin, and the other districts where this fragile manufacture has for centuries been carried on. Exclamations of rapture and envy burst forth as female faces were squeezed in front of robes, flounces, veils, collars, parasols, and every conceivable article of dress fashioned in thread lace of the most elegant patterns, and hung upon wax figures of fashionable air.

MACHINERY AND MECHANICAL CONTRIVANCES.

CENTRIFUGAL PUMPS.

THE peculiar force arising from the revolution of matter round a fixed centre, for ages distinguished for its action by the term *centrifugal*, holds a deservedly conspicuous position in the chronicles of dynamics. Commencing in the action of the earth itself, and known to the earliest of its inhabitants, it has nevertheless lain dormant, and all but useless, for the thousands of intervening years. Not until something like a century ago did it begin to assume any standing as a mechanical element, and it has been left for our own times to develope and apply it as an economically useful industrial agent. As a pump or water-elevator, we hear of it first in 1732; this, probably its earliest practical application, being by M. Le Demour, who read an account of his plan before the French Academy.

Since then, but not until a few years back, it has passed through an extensive series of occupations, with a rapidity as remarkable as its extreme sluggishness in earlier times. Watt's pendulum-governor—Seyrig and Manlove and Alliott's drying machines, the Tachometer, or speed-indicator, where the depression of a fluid in the centre of an upright revolving cup acts upon a fluid column, and points to the rate of revolution—Messrs. Hardman, Fruzell, Rotch, Bessemer, and Gwynne's sugar-separators—Shanks' pipe-moulder—and several varieties of pumps, are all examples of what we may term the taming down of the principle to useful ends. Were it our purpose, we could easily extend the list of processes which centrifugal power has improved and extended; but our more immediate object is the tracing out the various gradations of its introduction and employment as a pump.

We begin our history with the invention of M. Le Demour, in 1732.—Fig. 1 is an elevation of the pump. It is nothing more than a straight tube, A, connected in an inclined position with the vertical axis, B, carried in top and bottom bearings, and turned by a winch. The attachment of the tube is rudely made by three horizontal bars of iron projecting from the shaft, B, and bound to the tube at their opposite ends by ropes. The tube is slightly expanded towards its upper end, and as it is carried rapidly round the centre of the shaft, the centrifugal force impels the water up the open lower end of the tube, throwing it out at the top in a continuous stream. Of course the fluid so delivered must have fallen in a circular stream, which was probably caught by an annular trough, corresponding to the radius of the discharging tube; but on this head we are not clearly informed.

Fig. 1.

Considerable rapidity of motion is obviously necessary for the effectual performance of this kind of pump. Its action, as the nucleus of all subsequent modifications of centrifugal pumps, may be described as the throwing off the upper portion of the water-column in the rotary discharging pipe by the direct centrifugal force, whilst the atmospheric pressure being thus relieved from the upper end, the external atmosphere presses up a further fluid supply from the source below, into which the pipe dips.

1818, *Massachusetts Pump.*—An inventor, whose name is now forgotten, introduced a species of centrifugal fan pump, in the state of Massachusetts, U. S., and which we have distinguished as the *Massachusetts Pump.* Our engraving, Fig. 2, represents a vertical section of this pump in the plane of motion of the elevating blades. This form of pump very closely resembles the ordinary blowing fan of the present day (sometimes known as the "American bellows"), being simply a short horizontal shaft, carrying a square boss with four excentric blades, set excentrically within a metal case, having an upright discharging passage, A. The whole apparatus is sunk beneath the level of the water to be lifted, and the blades being made to revolve by the pair of external bevel wheels, the water is taken in at the central aperture, B, of the case, and being impelled forwards by the revolving blades, is finally discharged by the centrifugal force through the passage, A.

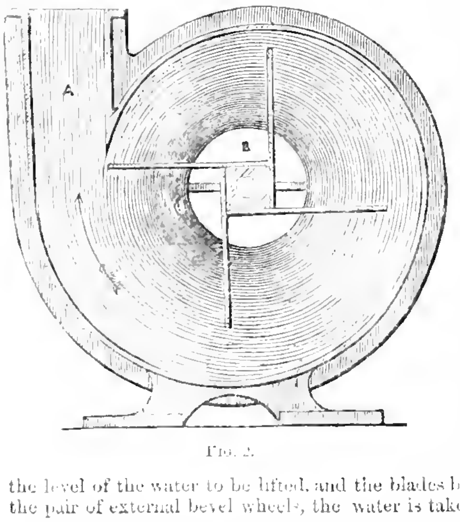


Fig. 2.

1831, *Blake.*—Apparently the next improvement was that by Messrs. Blake, of the *New Steam Mills, Connecticut, U.S.* Fig. 3 is a vertical section of this pump, which is remarkable as being the earliest known example of a centrifugal *disc* pump. Here the vertical driving shaft, A, has keyed upon it the single horizontal disc, B, working inside, and at a short distance above the bottom of the fixed case, C. The shaft is supported in a foot-step, carried in the pipe, D, which opens out from a central hole in the bottom of the case, and extends to the reservoir of water to be lifted. To the under side of the revolving disc are attached a series of radiating blades, E, working just clear of the bottom of the case. As the shaft and bladed disc rapidly revolve, the water is drawn into the case by the bottom central aperture, and is thrown out from the spaces between the blades at the periphery of the disc. This continued action of the centrifugal power then effecting a fluid pressure in the case, forces a column of water up the discharging pipe, F, opening into the top of the fixed case, and at right angles to its plane. This arrangement of discharge pipe at right angles to the motion of the fluid in the pump, mars, to a great extent this otherwise simple and effective apparatus, as it necessarily causes a most objectionable change of the direction of the fluid's motion.

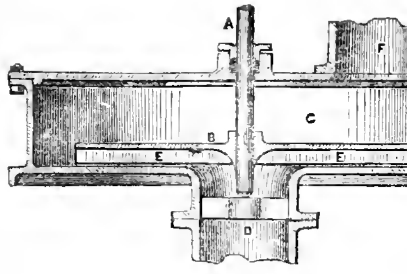


Fig. 3.

In 1839, Mr. D. W. Andrews, of New York, took out a patent for a centrifugal pump, which closely resembled the Massachusetts Pump, with some modifications, and need not, therefore, be described in detail.

1844, *Gwynne.*—In 1844, Mr. James Stuart Gwynne undertook a series of experiments at Pittsburg, U.S., with a view to the development of the central forces. These researches resulted in the invention and improvement of several machines, amongst which is to be reckoned his *Direct Acting Balanced Pressure Centrifugal Pump*, the first public exhibition of which occurred in January, 1849, at the Passaic Copper Mine. There he erected a pump 12 feet in diameter, and in 1850 obtained a patent for the invention in the United States, which he has also secured for Great Britain.

1845, *Bessemer.*—Mr. Henry Bessemer, of Baxter House, well known for his several ingenious mechanical improvements, entered the lists as an improver of the centrifugal pump in 1845, and obtained a patent for "Certain improvements in atmospheric propulsion, and in certain apparatus connected therewith, part or parts of which improvements are applicable to the manufacture of columns, pipes, and tubes; the other parts are applicable to the exhausting and impelling of air, *and other fluids generally.*"

It consists (see Fig. 4) of a circular cast-iron case, A, divided into two compartments by the division piece, B, cast in one piece with the rim of the case. One of these compartments contains the apparatus for *exhausting the air* (as described in the specification), and the other is occupied by an emission engine, C, which he employs for driving the apparatus. The rotary apparatus consists of two metal discs, D and E, placed parallel to each other and united by a series of flat radiating arms or blades, F, twelve in number, and projecting inwards from the periphery about half way, towards the centre. The whole is surrounded by a perforated metal plate, G; or wire gauze may be employed for this purpose. This perforated rim is for the purpose, as the patentee describes, of preventing the compressed air contained in the case from returning and interfering with the action of the blades. An opening, H, is formed in the case, corresponding to a similar opening in the disc, D, and serves as the inlet to the machine. The portion of the disc round the inlet opening is slightly raised, and placed so that the disc may be brought into close proximity with the case, without being in actual contact with it. The discs are connected with the driving-shaft, I, by a small plate keyed on to the shaft, and bolted to the interior of the large disc, E. The driving-shaft works in two stuffing-boxes cast on to the slides of the chamber containing the emission engine, which is of the ordinary construction, consisting simply of two arms, with their extremities curved in opposite directions, and supplied with steam by the shaft, I, which is made tubular as far as the portion

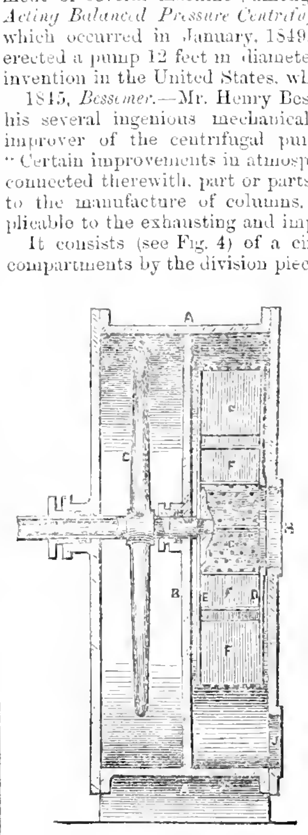


Fig. 4.

containing the arms. The outlet for the compressed air is formed in the case at J. This pump will either exhaust or compress, accordingly as the

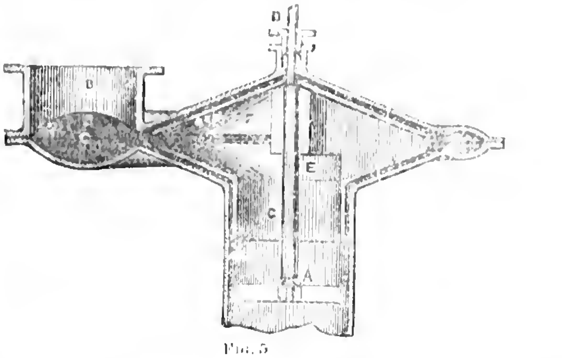


Fig. 5

pipe is attached to the opening, H or J. It is to be remarked, that throughout the description of this machine, nothing whatever is stated in the specification of employing it for the purpose of raising water; and it has,

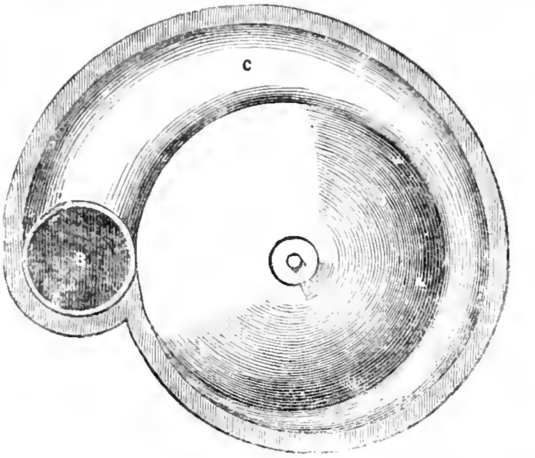


Fig. 6.

therefore been urged by Mr. Gwynne that Mr. Bessemer was not entitled to exhibit it, as a water pump, in the Great Exhibition; particularly with the following inscription attached to it:—

"This model of a Centrifugal Pump for forcing fluids, is constructed in rigid accordance with the specification of Bessemer's original patent, dated Dec. 5, 1845, being the first recorded invention for impelling fluids by the centrifugal force generated in a revolving disc."

1846, *Andrews' Improved*.—After employment on a great variety of work, Mr. Andrews' original pump of 1839 was again improved and patented in the United States, in March, 1846. This pump, the right to which has since been purchased by Mr. Gwynne, is delineated in the three views, Figs. 5, 6, and 7. Fig. 5 is a transverse vertical section through the case, hollow disc, and suction and discharge pipes, Fig. 6 is an external plan corresponding; and Fig. 7 is a plan of the four excentric blades, with the square boss by which they are attached to the shaft. In the introductory description given in his specification, Mr. Andrews states that these improvements are the results of his "experience in discharging water from wrecked vessels, in which sand, gravel, and other matters mingle with the fluid pumped up;" and adds, "It is well known that revolving parts of centrifugal pumps are sometimes tubes, and sometimes vanes or arms working within a fixed case, with which the suction and forcing pipes communicate. In my pump I use vanes, and I enclose them within, and connect them to an additional case, which revolves with them, within the exterior or stationary case." In our figures, the vertical pipe, A, opening into the centre of the right-lined portion of the case, is the suction-pipe leading to the water to be elevated: and the short vertical branch, B, at the termination of the external expanding elliptical channel, C, is the delivery passage. The vanes, four in number, are set excentrically on the shaft, D; and, as described by the patentee, are usually flat blades, as represented by the full lines of Fig. 7, but are sometimes curved to the form of the dotted lines. Their lower edges extend below the lower end of the squared bosses, and each has a portion removed, as at E, with the view of enlarging the passage.

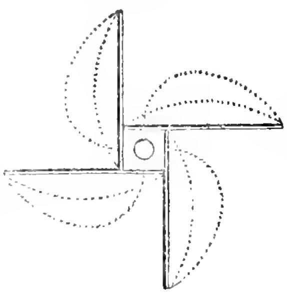


Fig. 7.

way of the water rising out of the suction-pipe into the compartments formed by the vanes. The case is similar in section to that of Mr. Andrews'

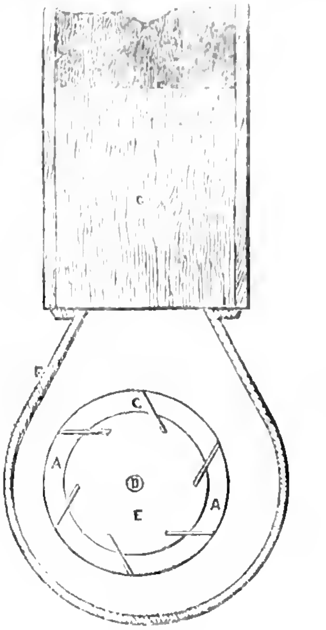
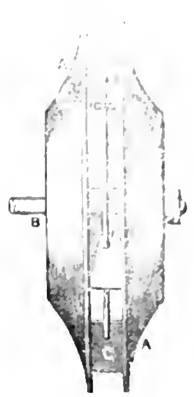


Fig. 8.

Fig. 9.



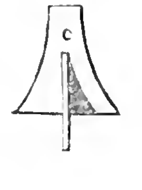


Fig 10.

earlier pump, being formed by two hollow cones, whose bases approach, but do not touch, each other; and set at a distance apart, equal to the depth of the small ends of the vanes. The depth of these tapered ends, and consequently of the space left between the peripheries of their conical covers, through which the water is thrown only by centrifugal force, is proportioned to the depth at the wide ends, so as to keep a sufficient volume of water within the revolving case, to fully supply the circular exit space; and by keeping a greater body of water revolving, increase the centrifugal force, enabling the pump to elevate water to a greater height with a given number of revolutions, and saving something in friction. As already quoted from the inventor's specification, the blades are enclosed within a hollow revolving case, F, working just clear of the external fixed case, and having a short projecting pipe, G, working within the head of the suction-pipe, its open end admitting the water from the latter into the revolving case. The shaft is passed through the upper side of the fixed case, in the centre of the cones, by a stuffing-box, and is supported on a projecting centre bearing, carried by cross-arms, in the suction-pipe. The water drawn through the central opening is thrown from the vane compartments, by the annular opening between the two peripheries of the revolving cone disc, into the spiral elliptical channel, the gradual enlargement of which towards the point of discharge, admits of the fluid being kept moving with the same velocity in all its parts, and prevents loss of power by friction.

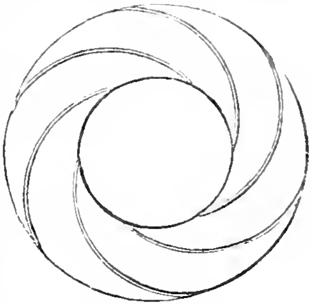


Fig. 11.

1848, *Appold*.—In Nov., 1848, Mr. Appold brought out a model of a rotary pump, as a convenient means of draining marshes, and instituted a series of experiments on it with 6, 24, and 48 arms or vanes. This pump attracted some attention at the meeting of the British Association in Birmingham, in 1849. Fig. 8 is a sectional elevation of the original six-vaned pump; Fig. 9 is a side elevation of the elevating disc detached; and Fig. 10 is an elevation of one of the vanes, with a portion of the central disc to which the vanes are attached. This is the form of one erected on the inventor's premises in Wilson-street, Finsbury: A A are the outer discs of the cylinder, fast on the shaft, B: and C C are the fan-blades held by the outer discs and the central plate, E. These fans, six in number, are set at an angle of 45°, with the diametrical line of the discs. The driving-shaft has a bearing on one side only, where it passes through a stuffing-box in the case, F, which opens up into the bottom of a rectangular delivering-case, G. The openings round the periphery of the cylinder are 1 inch wide, and at the centre the outer discs are 4 inches apart. The water to be raised is admitted through central openings in the outer discs, and as the cylinder revolves at a high rate, it issues, under the compulsory power of centrifugal force, by the circumferential openings, and is thence forced up the delivering channel to the discharge-opening at H. The opening on the top of the case, F, is 9 inches by 7 inches, and the wooden case, G, which

BRONZE AND OR-MOLU CANDELABRA, FROM RUSSIA.

carries the water from it to the required height, is 10 inches square. The discharge opening in this case is 6 feet above the water level, made so as to close when the water is to be raised higher up. The cylinder, with its case, stands in a cistern of water, 6 feet by 3 feet, and 3 feet deep, giving about nine gallons for each inch in depth. At a speed of 540 revolutions per minute, the discharge in this time was 1093 gallons; this being all passed through an annular opening, 1 inch wide by 38 inches in circumferential length.

In later modifications, (see fig 11), Mr. Appold has substituted curved blades for the straight ones. He states that the curved blades discharge more water than the straight ones; but it is a question, whether, in changing the sectional form of his case from the form of Fig. 9 to a rectangular one he has not committed an error.

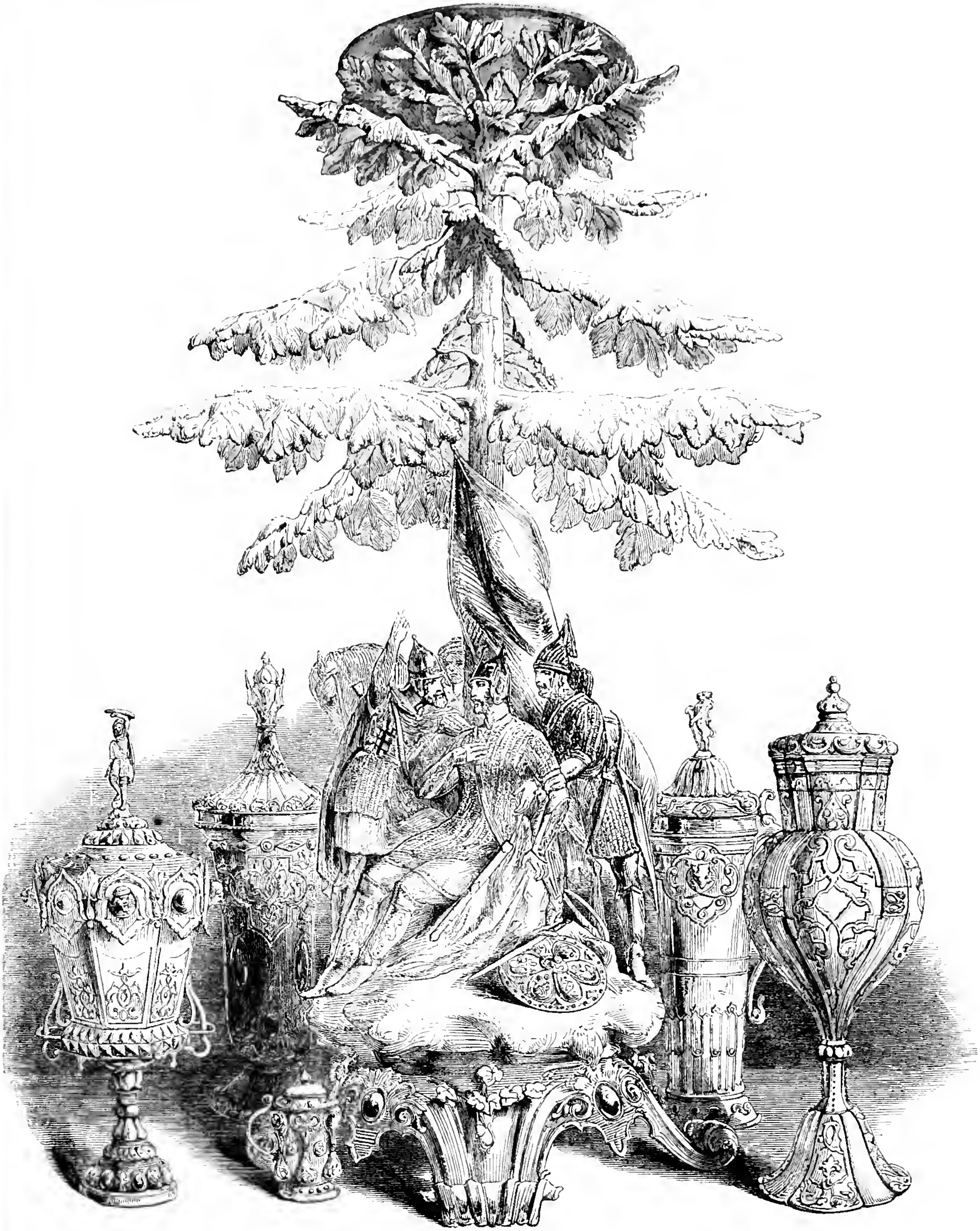
(To be continued.)

RUSSIAN CANDELABRA AND ORNAMENTAL PLATE

THE candelabra in the Russian Court were justly admired for their gorgeous magnificence. Varied in form, they exhibited a splendour of material (bronze gilt), a *grandiose* character of design, and a masterly finish, which one might almost pronounce it to be impossible to excel. The largest one by Chopin, of St. Petersburgh, standing about 15 feet high, and intended for 81 candles and 4 candle lamps, is valued in the Catalogue at 633*l.* 6*s.* 8*d.*

The ornamental works contributed by Russia were numerous, and of a remarkably high order of merit.

The objects we have engraved are selected from those exhibited by the house of Sazikoff, of Moscow. The principal one is a large centre-piece, comprising a group representing Dmitri Donskoi, Grand Duke of Muscovy, after the battle of Koulikoff, in 1380, which delivered Russia from the yoke of the Tartars, under which it had been oppressed for 150 years. The artist has chosen the moment when Prince Michael Tverskoy comes to announce to the Grand Duke, who, having been wounded, is reclining under a palm-tree, that the victory has been gained. The figures are extremely well designed, and the general effect highly artistic. There are other smaller fancy subjects distributed in various parts of the glass case, such as a goblet representing a Cossack woman, another with a Finish hunter, a third with a milk-woman, and a paper press ornamented with a group of a dancing bear with peasants, all characteristic and capitally executed.



GROUP OF RUSSIAN PLATE.

Besides these, are cups, some of the Byzantine style, some of the Russian, and various other subjects, which reflect great credit upon the taste of the old Russian capital.

Verkhovzoff, of St. Petersburgh, had also a very handsome display, though of fewer works, including a bas-relief in silver on a gilt ground representing the Descent from the Cross, chased by hand; and another representing the Crucifixion, Prophets, and Evangelists, also chased by hand, in the old Byzantine style, and intended as an upper cover for the New Testament.

HISTORY OF INDUSTRIAL EXHIBITIONS.

II. (Continued.)—Art in France from the Thirteenth to the end of the Eighteenth Centuries.

THE second official exposition of French industry, like the first, was dedicated to the anniversary of the Republic. France was still at war; but the treaty of Luneville had already been signed, and the preliminary articles which had been negotiated between France and England were to be signed in London only a few days after the proposed opening of the second exposition. Encouraged by the pacific aspect of affairs, the manufacturers made prodigious efforts, and the result surpassed the most sanguine hopes of the government. The Louvre was the scene of this second national exhibition. Two hundred and twenty exhibitors were admitted to the competition—about double the number of those who had figured in the first exposition. The government, recurring to the first exposition, had decided that the same number of prizes which had been distributed on the former occasion would suffice for the second; but the rapid advances which the manufacturers had made within the short space of three years, proved at once the insufficiency of the rewards: and it became necessary, in order to meet the progress which had been made, to set aside the seven manufacturers who had obtained gold medals at the first exposition, and eight of those who had already obtained silver medals. From this necessity arose the custom adopted in subsequent expositions, of voting only the confirmation of previous rewards in favour of those who maintained honourably their acquired position. At this exposition ten gold, twenty silver, and thirty bronze medals were awarded.

In the year VI. no manufacturer of woollen goods was classed among the prizeholders of the first order. Before the Revolution, French manufacturers depended upon foreign wool for their finer fabrics: but the exertions of Chaptal (who has been called the Colbert of the nineteenth century) changed the face of affairs in this respect, for we find that in this second official exposition a space was set apart for the display of French woollen fabrics manufactured from the fleeces of the Spanish breed of sheep naturalised in France. Thus, within a few years, the French saw the cultivators of their own raw material challenging comparison with those of the Peninsula. The jury, in the name of France, acknowledged the debt of gratitude due to MM. Gilbert, Tessier, and Huzard, three members of the Institute, "for the zeal and perseverance with which they have watched over and improved native wool." (*Report, year IX.*)

In the year VI., the highest degree of fineness to which native manufacturers spun cotton was No. 110, and this number obtained a prize in the exposition of that year; the exposition of the year IX. contained cotton spun to the degree No. 250.

The Baron Charles Dupin declares that in the year VI. the cotton fabrics of England without doubt surpassed those of France; and he refers to the products exhibited at the second national exposition, consisting of velvets, nankeens, stockings, &c., to show how rapidly his country had advanced towards that degree of excellence which he allows English goods to possess indubitably.

The manufacture of leather had also made extraordinary advances within the same short period. At the time of the first exposition, only the most common leathers were dressed in France: in the second exposition were found moroccos from Choisy le Roy, that might have challenged comparison with those of Turkey. The carpets of Sallandrouze, the china of Sèvres, the earthenware of Sarreguemines, and the beautiful printing of Didot, Herhan, and Piranesi, were especially commended by the jury.

Names which will be known as long as an enlightened patriotism and commanding talents receive the homage of men, were included among those of the members of the central jury on this occasion. We should mention Berthollet, Berthoud, Guyton de Morveau, De Prony, Vincent the painter, and M. Costaz, the framer of the report. At this exposition the renowned Jacquard obtained only the bronze medal for his important improvement in Vaucanson's loom. M. Burat, commenting upon the insufficiency of the prize awarded for so important an invention, warns us not to blame the jury for holding Jacquard's improvement in a comparatively trivial light, inasmuch as the manufacturers and weavers themselves hardly deigned to bestow a moment's notice upon it.

The history of the Jacquard loom has its moral. "Until its introduction," Mr. Bischof writes in his history, "the production of the superior figured silks depended solely on the skill of the weaver, and that to a degree which few attained. The necessity of extreme carefulness and skill is now considerably diminished; in other words, the production of the most costly fabrics is laid open to a large number of operatives. Jacquard was originally a manufacturer of straw hats: and it was not till after the peace of Amiens had been signed that his attention was attracted to machinery. Happening one day to take up an English newspaper, his attention was arrested by a paragraph, in which the Society of Arts (to their honour be it recorded) offered a premium to any person who should weave a net by machinery. Dr. Bowring, who had a personal interview with him many years afterwards, tells us that the perusal of this extract awakened his latent mechanical powers, and induced him to turn his thoughts to the discovery of the required contrivance. He succeeded, and produced a net woven by machinery of his own invention. It seems, however, that the pleasure of success was the only reward he coveted; for as soon as accomplished he became indifferent to the work of his ingenuity, threw it aside for some time, and subsequently gave it to a friend as a matter in which he no longer took any interest. The net was by some means at length exhibited to some persons in authority, and by them sent to Paris. After a period had elapsed, in which M. Jacquard declares that he had entirely forgotten his production, he was sent for by the Prefect of Lyons, who asked him if he had not directed his attention to the making of nets by machinery. He did not immediately recollect the circumstance to which the Prefect alluded; the net was, however, produced, and this recalled the fact to his mind. The Prefect then rather peremptorily desired him to produce the machine by which the result had been effected. M. Jacquard asked three weeks for its completion; at the end of which time he brought his invention to the Prefect, and directing him to strike some part of the machine with his foot, a knot was added to the net. The ingenious contrivance was sent to Paris, and an order was thence dispatched for the arrest of the inventor."

Here Dr. Bowring is in error. Napoleon's order was to the effect that M. Jacquard should be conveyed to Paris with all possible dispatch; and the spirit of those who interpreted the imperial command led them to believe that nothing less strict than an arrest could be meant in the case of a man who threatened to injure the weavers of Lyons so seriously.

On his arrival in Paris he was installed in the Conservatory of Arts, and set to work to make his machine on a large scale. He fashioned everything with his own hands; the wood-work and the iron-work were shaped by his dexterous and unerring arm. It is related of him that one morning he paused from his labours to consider the principle of a most complicated machine invented for the purpose of weaving a shawl for the wife of Napoleon. "His body bent, with his hands resting on his knees, which was indeed his ordinary attitude, his eyes were busy in every corner of the machine, and a droll smile half opened his lips as he inquired of the *directeur* under whose orders the workmen were employed—

"'Rather an expensive job that, sir!'

"'Twenty thousand francs!'

"'Diable!' exclaimed Jacquard; 'why in yonder corner is a machine by Vaucanson, which, with a little attention, would answer the same purpose, and would not cost more than five hundred! It is a pity that serious attention is not paid to Vaucanson's clumsy invention, for it contains the principles of all combinations in weaving: I must look to that.'

"And away posted Jacquard, and shutting himself up in the workshop allotted to him, set to work with the saw, the chisel, and the plane. At first he constructed from memory a model of Vaucanson's machine, for he thought it would be convenient to carry to Lyons as a curiosity for his wife. Then, with the model before him, he made alterations; brought the principle to better application—simplified it. Nothing wearied his hand nor fatigued his brain, whilst he thus laboured in the construction of machine the most remarkable in its combinations, and the most wonderful in its results.

"When he had completed his machine, he was sent back to his native town with a pension of a thousand francs, which was subsequently raised to six thousand francs. Notwithstanding the patronage and approval of Government, he had the greatest difficulty to introduce his improvement among the silk-weavers; and so great and blind was the animosity of these artisans against him, that he was more than once in danger of losing his life at their hands. The council of *prud'hommes* ordered his loom to be broken in the public square of his town, to be sold as rubbish, and himself to be held up to public execration as an enemy of his species. The experience of a few years, however, sufficed to change the aspect of affairs totally; and he had the ultimate satisfaction of knowing that it was by means of the increased facility of production effected by his invention, that the looms of Lyons were enabled to compete with foreign markets."

III.—National Exhibitions of Industry under Napoleon.

The three years which intervened between the first official exposition of France and the second were marked by rapid advances in all departments of agricultural and manufacturing skill. The impetus thus given by the first exposition was renewed with additional force by the second; and although only twelve months intervened between it and the third exposition, the progress that had been made within that year was found to be almost unprecedented. As the number of competitors at the second of those expositions had doubled that of the first, so did that of the third exceed that of the second. The utility of such exhibitions had been fully proved by the two experiments; and on the third occasion the triumphs of a generous competition were evinced in a remarkable degree.

The most remarkable feature of the exposition of 1802 was the progress it showed in the application of machinery and chemistry to industrial improvement. Twenty-two gold medals were distributed on this occasion. Among the prize-holders were Aubert, who exhibited his stocking-frame; Montgolfier, who sent his hydraulic ram: and Vaucanson, who produced his silk spinning machine. This machine has been alluded to in the previous chapter, as that which suggested to Jacquard the idea of the invention which has immortalised his name. These inventions, destined to change the face of the commercial world, to provide labour for the yearly increase

of the populations of civilised states, and to lay the foundation of the brilliant era which is now dawning upon the world, though they were received as productions worthy of the most honourable prizes, did not create that enthusiasm which great improvements in machinery now call forth. Indeed, in those times the industrial world, so narrow was its view, regarded improvements in machinery as invasive of the mechanic's best interests. The words in which M. Jacquard's machine was described in the report of his jury were suggestive. In proportion to the general enlightenment of a people is the popularity of inventive genius. When, in the year 1695, M. de Gennes made his first attempt to weave by machinery (his loom is described in the "Philosophical Transactions" for 1700*), his efforts created little attention, and, probably, not the faintest applause; and when Hargreaves discovered his ingenuity to the world, his skill was rewarded with persecution. Even now, men exist beyond the walls of Bedlam, who look with a longing gaze to the weavers of Bandar Abassi, who, like the Hindoo weavers, perform their work in the fields. They would be glad to see the spinning jenny and the Jacquard loom cast aside or burnt, and behold the Spitalfields weaver lay his warp upon the ground, dig a hole for his feet, and work with a reed tied to a tree for his shuttle. The benefits of machinery, however, are easily proved; but it has been a hard fight to persuade the hungry workman, temporarily deprived of his employment by a few ingeniously-contrived cog-wheels and cranks, that he should hail the advent of his present enemies for their promises of future good. It was, therefore, a bold step, when manufactures were once more reviving in France, as the tides of revolutionary blood rolled away, to award gold medals to such inventions as Aubert's stocking frame, and Montgolfier's hydraulic ram.

MM. Decroiselles, of Rouen, and Amfry and Darset, of Paris, were also the recipients of gold medals as the rewards for the excellence of their chemical products. The attention which French chemists have, for a long time, given to the production and perfection of dyes, has won for the dyes of France a reputation which we are only now endeavouring to equal. From the remote antiquity when the purple wool (the sacred symbol of royal and sacerdotal dignity), which formed the staple article of Tyre's commerce, was valued at a hundred crowns, experiments have been constantly going forward, to extract various colours from a thousand different substances, both animal and mineral. Hardly a plant, an animal, or an earth, have escaped the scrutiny of the experimentalist. Gage, Cole, Plumier, Reaumer, and Duhamel have endeavoured to extract a purple, like the famed Tyrian dye, from various shell-fish, but without success.† The names of honourable renown in these researches belong mostly to France—Plumier, Reaumer, Duhamel, Hellot, Dufoy, Berthollet.

The popularity of this third official exposition was worthily followed up. We may fairly attribute the practical intelligence which suggested the Société d'Encouragement to the First Consul. The object of this society was to stimulate the ingenuity and artistic force of the country by the award of premiums. In its first programme we find Napoleon the holder of one hundred shares, M. Recamier of fifty, and the Minister of the Interior of fifty. The premiums offered at first amounted only to small sums, but the Parisian Society of Arts and Manufactures of the present day tempts native talent by the annual award of vast amounts. The youth of France are prepared fully to enter into the quinquennial competitions which their government calls them to engage in. Sir David Brewster, in the course of his introductory address, delivered in July, 1850, to the British Association for the Advancement of Science, when referring to the encouragement which the various governments of France had unanimously accorded to the arts and sciences, said very pertinently:—"Owing to the prevalence of scientific knowledge among all classes of the French population, and to their admirable system of elementary instruction, the advancement of science, the diffusion of knowledge, and the extension of education are objects dear to every class of the people. The soldier as well as the citizen—the socialist, the republican, and the royalist—all look up to the National Institute as a mighty obelisk erected to science, to be respected and loved and defended by all. We have seen it standing unshaken and active amid all the revolutions and convulsions which have so long agitated that noble but distracted country—a common centre of affection, to which antagonist opinions, and rival interests, and dissevered hearts have peacefully converged. It thus becomes an institution of order, calculated to send back to its contending friends a message of union and peace, and to replace in stable equilibrium the tottering institutions of the state."

It is unnecessary to recapitulate the overwhelming advantages which the French mechanic has long had in artistic education over the English mechanic. The recent introduction of Schools of Design sufficiently demonstrates the difference that has existed between the chances of the competing operatives; and where even now, shall we find gratuitous schools in London for drawing and painting similar to those which exist in every one of the twelve arrondissements of Paris? These fine national institutions have yielded to France the reputation which she now holds of leading, in matters of taste, the manufactures of the world. Under the sagacious rule of the Emperor, the commercial value of art was fully recognised; and although four years elapsed between the third exposition and the fourth, no time was lost in the interval.

On this occasion the national exhibition of industry was held in a spacious building erected for the purpose on the Esplanade of the Hôpital des Invalides. It is only necessary to compare the textile goods manufactured in France in the year 1801 with those manufactured in the year 1806, to see at once the marvellous rapidity with which improvements had been introduced. At this exhibition the printed cottons of Mulhausen and Fogelbach (manufactures which have been ever since highly esteemed in every quarter of the globe) first made their appearance.

The elegance of design and beauty of dye for which these manufactures are still celebrated, have saved the manufacturers of Alsace from irrevocable ruin. Mr. Thomson fairly shows, from the statistics of a Mulhausen manufacturer, M. Koechlin Schouch, that it has long been impossible for a Rouen or a Mulhausen manufacturer to compete with a Manchester cotton firm. The case stands therefore simply thus—that while France has been developing the artistic faculties of her workmen, the people of England less sensitive, from the want of national education, and perhaps constitutionally, to the beauties of form and colour, have advanced in the power of simple production. Manchester can produce a printed calico at a greater speed than Rouen; but Rouen can imprint the finer designs and dyes upon its fabric.

Cotton lace, blonde, silk thread, cloth, imitations of Cashmere shawls, and various mixed textile fabrics, also illustrated the manufacturing progress of France, in the industrial exhibition of 1806. In the manufacture of iron and porcelain progress was decidedly shown. These cheering results of Napoleon's vigorous efforts to restore the manufacturing prosperity and reputation of his country were manifested in the last exposition which took place under the Empire.

It is noticeable, as indicating the general tendency which the various ruling powers of France have shown to cultivate native manufactures and arts, that her national exhibitions have celebrated the dethronement of the Bourbon family, being fostered by the bitterest enemies of the Bourbons, and have inaugurated the restoration of the Bourbon Monarchy. It is impossible not to discover, in this constant solicitude for the alliance of art and manufacture, the source of that artistic greatness which has made the French people the leaders of taste in every part of the world. The alacrity with which their example in holding periodical exhibitions of native industry has been followed by other countries, and the invariable good which has resulted from them, induced the Baron Charles Dupin to preface the report of the jury for the exposition of 1831 with this sentence:—"Thus, the constantly increasing success of the exhibitions of our industry has attracted the attention of foreign powers. Nearly all the governments of Europe have endeavoured to follow our brilliant example, even those which appear to be the least progressive in their principles. Austria, Spain, Piedmont, Portugal, the two Sicilies, Holland, Prussia, Bavaria, Denmark, Sweden, and Russia, have established national expositions, with such success that they have made them periodical. Among all the powers in Europe, England alone thinks herself too rich and advanced to need recourse to such a stimulant." Our next chapter will bring the history of the exhibitions of France to a close.

BELGIAN SCULPTURE IN THIS SHEET.

M. SIMONIS' gigantic performance of Godfrey de Bouillon, the original of which, in bronze, was inaugurated at Brussels, in 1848, is an exhibition of considerable animal development, but has no pretensions to take rank as a work of high art. The treatment is vulgar and exaggerated. The knightly Crusader bestrides a war-horse of heavy proportions, which he has suddenly reined in, as he waves on high a flag as a rallying sign for his followers. Godfrey de Bouillon, as our readers may be aware, was the leader of the second Crusade, having been proclaimed king of Jerusalem, A.D. 1099.

At the base, on either side of this spacious work, stood two little fanciful subjects in marble, which, though in themselves of a vulgar type, are executed with considerable *finesse*. The one represents a little urchin, stretched at length and at his ease, admiring the hideous physiognomy of a little Punchinello with which he is playing; in the other—so pass away the fleeting joys of childhood—we have his companion blubbering over the ruins of his toy drum, which with excessive beating he has broken. The heart-full contentment of the one, and the blatant ungovernable misery of the other, are well depicted, and have obviously been taken from nature.

Another Belgian artist, M. Geefs, has a very pleasing and clever work—a female, with most bewitching and coquettish air, cutting the claws of a lion, who, spell-bound and flattered, submits willingly to the operation. Underneath is inscribed a couplet, which explains the moral intended to be conveyed:—

> Amour, amour! quand tu nous tiens,
> On peut bien dire, "Adieu, prudence!"

In paying a passing compliment to this *spirituel* performance, we would by no means be understood to allow its claims as a subject worthy of art in its highest walk. This work is represented in our view of the Belgian Court.

* A machine which *suppresses* a workman in the weaving of figured goods.

† Indigo, one of the most useful of all dyes, was denounced as a dangerous drug by Parliament, and it was forbidden in the reign of Elizabeth: this act was only repealed in the time of Charles II.

THE BUILDING COURT.

MINERAL PRODUCTS AND MANUFACTURES.

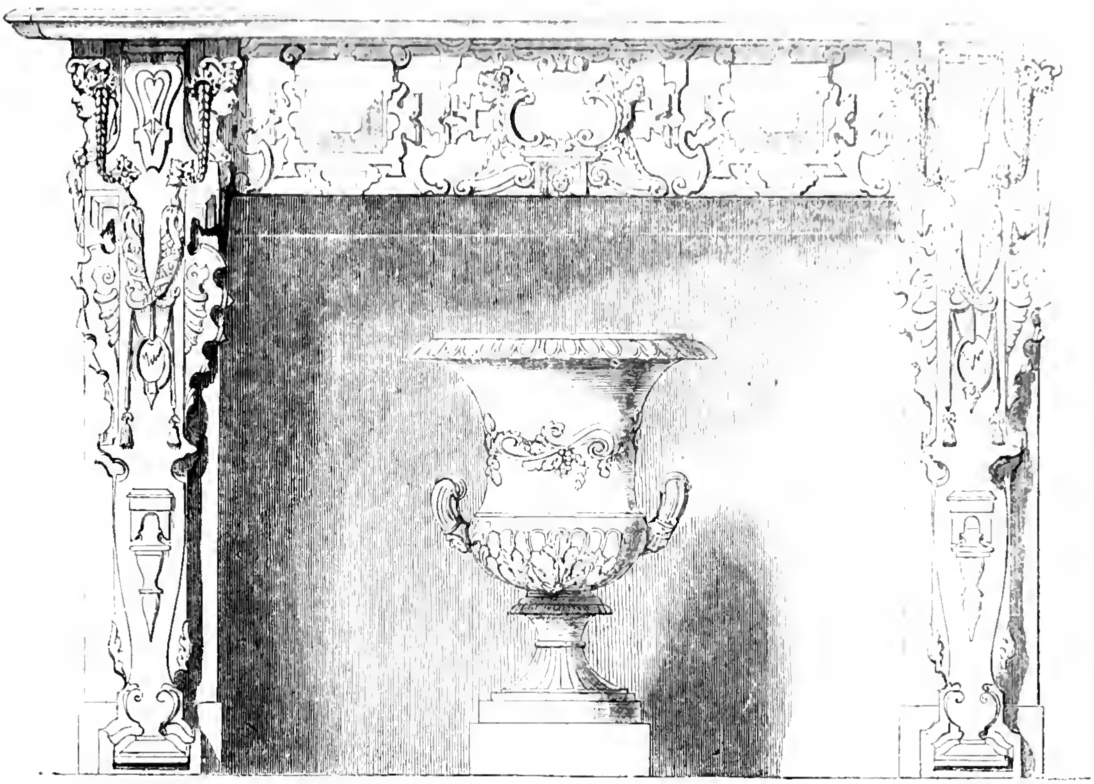
THE BUILDING COURT.

ONE of the most interesting and important departments in the Great Exhibition was that comprising the mineral products of the United Kingdom—both in the rough state, and in various manufactured forms. The latter works in this department were exhibited in what was generally known as "The Building Court," which contained a great variety of specimens of ornamental works, chiefly of an architectural character, and also samples of cements, artificial stone, and other componnded materials intended to be used as substitutes for stone and marble. A field so comprehensive and so richly supplied cannot be adeqnately described in a single notice, and we shall therefore have occasion to recnr to it in future publications. We commeuce with an account of some of the more valuable mineral products of Great Britain.

The variety of ornamental materials afforded by the rocks of our own country is far greater than is generally imagined. In two departments of the Exhibition the proof was afforded that, for decorative purposes, we need not go out of this island, since British marbles, granites, porphyries and other stoues of a very beautiful character, were here displayed.

On the outside of the building the Cheesering Granite Company erected an Ionic column wrought from their extensive quarries near Liskeard, in Cornwall. The shaft of this column is thirty feet long, and is chiselled out of one piece. When we consider the quantity of material which has to be removed to produce a

work of the fine character here shown, we shall arrive at some idea of the size of the block which was quarried in order to produce it.



CHIMNEY-PIECE AND VASE IN TERRA COTTA, FROM THE LADYSHORE WORKS.

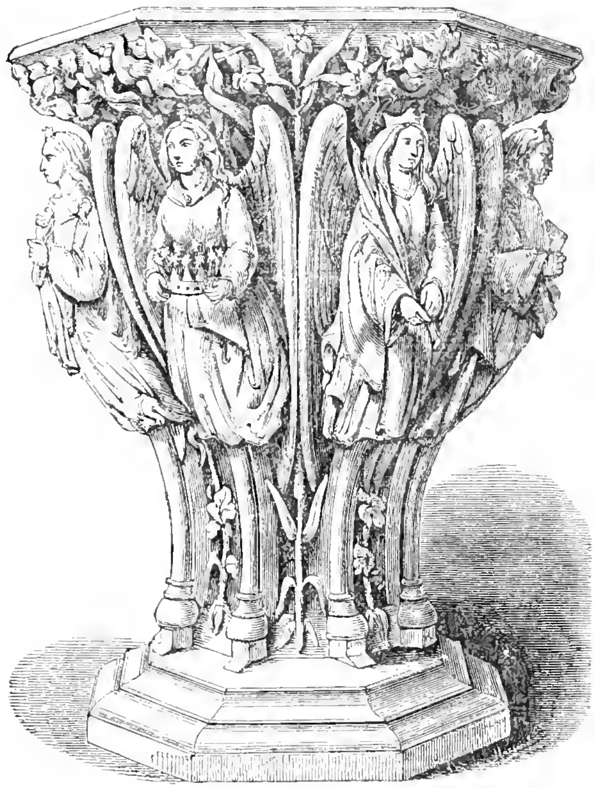
The *granites* of Cornwall and Devonshire vary very much in character—the peculiarities being, no doubt, due to local causes affecting the masses

WORKS IN ARTIFICIAL STONE.—RANSOM AND PARSONS.

at the period of their slow consolidation. All the granitic masses of this country present a singularly isolated appearance. The several localities of the western district, with which we are now dealing, may be distinguished as St. Michael's Mount, or the Penzance locality; Tregonning and Godolphin Hills, or the Helstone district; Carn Brea, near Redruth; St. Agnes; St. Columbe and Roche, Callington; and Dartmoor. Of the character of several of these we were enabled to judge from the following examples amongst the building-stones in Class I., in addition to the specimen already named:—Mr. R. Hosken, of Penryn, sent a granite obelisk and base, weighing 15 tons, from the quarries at Carnsen, near Penryn; this was

placed outside the building. The Truro committee, and the committee of Falmouth and Penryn, have made a large selection of this variety of stone; and the collection of granites exhibited by Messrs. W. and J. Freeman, included not only Cornish and Devonshire specimens, but granites from almost every part of the British Isles. This stone is usually divided into first, second, and third grits, according to the degree of fineness exhibited by its associated crystals; and of each of these sorts good examples were to be seen.

Granite is generally composed of quartz, mica, and felspar, the latter sometimes occurring abundantly, and giving to the granite a porphyritic character. Schorl is occasionally associated with granite: but this peculiarity is usually confined to detached and comparatively small masses.



[illegible] FONT.—[illegible] AND CO., OXFORD.

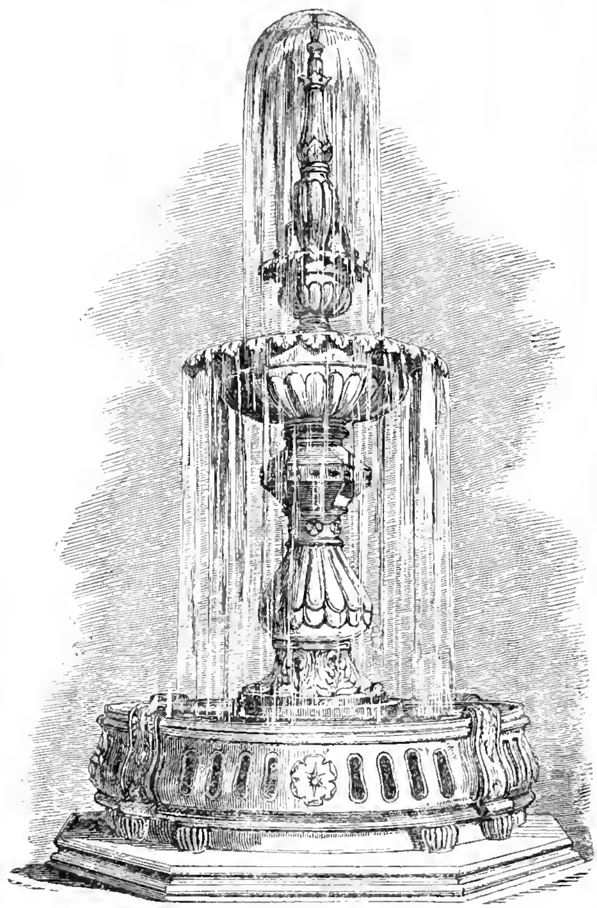
In considering the economic value of this stone, it must not be forgotten that difficulties attending the transport of large masses prevent many very valuable quarries from being worked. This is shown in a remarkable manner in a beautiful white and fine-grained granite, existing near Oakhampton, on one extremity of the Dartmoor range; this stone, although peculiarly fitted for the highest character of ornamental work, and therefore such as would command the best market price, cannot be brought into use, owing to the expense of land carriage. In the event of a railroad being carried through this district, this granite would be a most valuable property.

The quantity of granite exported from Devon and Cornwall has been, owing to the fluctuating character of the demand—depending principally on the construction of great works—exceedingly variable. The export from Penryn, the principal port from which the Cornish granite is shipped, has been as follows:—

In 1824	10,178 tons.
1826	18,179 „
1835	8,310 „
1837	5,295 „
1843	10,121 „

The total quantity of granite exported from Cornwall annually may be considered to be on the average between 20,000 and 30,000 tons. A large quantity is brought down from the Dartmoor hills by a railroad to Laira, near Plymouth, and shipped from thence. The price of granite varies according to its quality, from two to three shillings the cubic foot.

In addition to granitic building stones, we find also examples of the *felspar porphyritic rocks*, which are an excellent building material, and some varieties highly ornamental. These are provincially termed *elvans*, and are evidently the result of high subterranean temperature—the fused masses having been injected into fissures running across the granite and slate rocks. These fissures (elvan dykes) vary in width from a few feet to as many as four hundred feet, and extend in length over many miles. When they have not suffered from decomposition they are very durable, and may be considered as the principal building stones of Cornwall. Several examples of these were amongst the contributions of the Truro and other Cornish local committees. With the exception, however, of the Truro committee, it does not appear that those bodies have done justice to themselves. It certainly would have been of commercial importance to have selected the best examples of each district, and to have furnished descriptive labels by which the cost of production might have been ascertained. Again, merely rough stones caught up by the roadside do not afford the sort of information required. The example which has been



EARTHENWARE FOUNTAIN.—RIDGWAY AND CO.

given in many cases should have been carried out in all; the stones should have been cut in cubes, and they should have been differently dressed on their several faces. The examples of building and road stones furnished by the Falmouth committee were sadly deficient in this respect.

Another very beautiful stone, which has been very much neglected, is the *Serpentine* of the Lizard Point. This is one of the handsomest rocks which we possess. Outside the building was a fine block, partly polished, showing its peculiar character; and in a cabinet in Class XXIV., the Penzance Serpentine Company well exemplified this material in all its characteristics. Some of it presents an olive-green ground, through which red veins traverse, and these are varied by lighter tints. Another variety, which is very hard and durable, has a reddish base, studded with crystals of diallage, which in the polished state appear with a fine metallic green tint; and through these, white veins of steatite run in a somewhat singular manner. The conditions under which the serpentine rock is found, lead to the conclusion that it is an eruptive rock, vomited forth during the period when our great Trappean ranges were in progress of formation. This rock varies very much in its character: its usual composition may, however, be stated to be, on the average—

Magnesia	38·50
Silica	42·50
Alumina	1·00
Oxide of iron	2·12
Oxide of manganese	0·70
Oxide of chromium	1·36
Lime	0·25
Water, carbonic acid, &c.	13·57
	100·00

The serpentine rock—also known as the ophite, in allusion to its spotted

r variegated appearance, like the skin of a snake—is, therefore, a magnesian mineral.

Although vases and small ornamental articles have been manufactured n the county of Cornwall for some years, it does not appear that any large works have extended beyond its immediate vicinity until the late Exhibition, with the exception of some pilasters and pedestals in the Museum of Practical Geology.

Mr. Organ, for the Penzance Serpentine Company, exhibited two very ne obelisks of this stone—the red variety, and a very elaborately wrought aptismal font of the green kind. Besides these were a chimney-piece and many very good copies of ancient vases, and the cabinet of serpentine and teatite specimens already alluded to. The pedestals and obelisks, from heir character, show in a very striking manner the peculiar beauties of his stone, which we must certainly regard as one of the richest, in point f colour, of any of our ornamental stones. Now that attention is directed o the serpentine rock, we have little doubt that it will be largely employed or internal decoration.

Mr. Pearce, of Truro, made a very interesting display of tables, canelabra, vases, pedestals, tazza, &c., of Cornish granites, porphyries, steatites, nd serpentines. The granites selected present some of the most remarkble conditions under which this rock occurs. One specimen, in which he crystals of Schorl are very large and numerous, is alike singular and eautiful. The porphyries are also very fine, and, in connection with the erpentines and steatites, show that Cornwall can produce numerous highly rnamental stones. The excessive hardness of the serpentine is an imporant peculiarity of this stone, and it has been proved, by experiment, that ven the polished varieties may be exposed to the influences of the atmoshere for a long period, unprotected, without losing any of their brilliancy f surface. All that is required in reference to this material is that he stone should be quarried from the mass, and that the superficial oulders should, for all large works, be rejected. The loose boulders ying on the surface have generally suffered from disintegrating influences, nd therefore are liable to flaws, whereas the stone which is deep in the nass is perfectly free from this objection.

In the cabinet of Serpentines and Steatites many specimens show small ieces of native copper imbedded in the rock. The occurrence of this metal n the serpentine is peculiar. Mr. Berger exhibited two very large masses, which were well deserving of examination, as being the most remarkable pecimens of native copper ever found in this country. It is usual to find disseminated through small cracks in the serpentine, as though it had een at some period poured into them in a melted condition. It may ppear to many that the colour of the serpentine is due to this metal. This is not the case. The red and green varieties owe all their characterstic colours to the different oxides of iron, manganese, and chromium. The slates of some parts of Cornwall are of the most valuable kind; those f Dolabole have long been famous. The old Dolabole Slate Company, by Mr. J. Carter, of Camelford, exhibited some remarkable slabs, and a large late cistern; while Mr. Stirling, of Lambeth, also displayed, in his slate abinet, in Class I., some other examples of the same stone. In the main venue, Mr. Champernowne, of Totness, had two columns of the Madrepore narble; and in Class XXIV. sundry examples of Devonshire limestones. Mr. W. S. Brendon, of Yeolm Bridge, near Launceston, exhibited a chimney iece, pavement, and skirting for an entrance-hall, executed in the Yeolm late and polyptant freestone. These appear to constitute the principal xamples of the building and ornamental stones of western England. The eautiful display of manufactured stone from Derbyshire, and the examples rom other districts, must form the subjects of separate consideration. The Exhibition has, we believe, directed attention to some of our lithoogical treasures which have long lain unnoticed, but which, we have no oubt, will soon be in large demand.

CARVED FONT. BY MARGETTS AND EYLES.

The workmanship in this elaborate production, which is in Caen stone, is uch as leaves us no room for complaint. It is unexceptionably neat and mooth. The style of the composition, however, is of the very thick of nediæval absurdity, and demands unqualified disapprobation from those who are anxious for the advancement of art, and the principles of rational oetry upon which art should be founded.

WORKS IN ARTIFICIAL STONE. BY RANSOM AND PARSONS.

The artificial stone and marble produced by Ransom and Parsons, of pswich, exhibit all the essential qualities of hardness, colour, and surface. The various objects which we have engraved show the applicability of hese materials to all descriptions of building and decorative purposes.

This preparation differs from cements and other artificial stone, in the mployment of silica, both as the base and combining material. The naterials, consisting of sand, clay, fragments of granite, marble, &c., with portion of pounded flint, are moulded into form by the aid of a solution f silicate of soda, and are then burnt in a kiln to a red heat.

EARTHENWARE FOUNTAIN. BY RIDGWAY & CO.

RIDGWAY & Co. of Newcastle-under-Lyne, besides their general assortnent of household services in porcelain, exhibited various other articles in earthenware, as pipes, fountains for gardens, and conservatories, &c. One of these we engrave.

CHIMNEY-PIECE AND VASE IN TERRA COTTA.

TERRA COTTA—literally, baked earth—is a species of earthenware composed of potters' clay, fine sand and pulverised potsherds, reduced to a thin paste, and then cast in porous plaster moulds which absorb the water. It is left to dry, and afterwards baked, beginning with a very low, and rising to a very high temperature. The Etruscans were famous in this art; many examples of their works are preserved in the British Museum. In England it has of late years been practised with considerable success. The Elizabethan fire-place, and the vase represented in our Engravings, are among the many favourable specimens which were displayed in the Great Exhibition.

SAUNDERS' IMPROVED BANKERS' PAPER.

THE specimens of paper for which a prize medal was awarded, exhibited by Mr. T. H. Saunders, of Queenhithe, London and Dartford, Kent, comprised, in addition to superior samples of book and writing papers, a sheet of paper which, although weighing less than one ounce and a quarter, sustained without fracture more than five hundred weight.

In Case 36, Section 17, Mr. Saunders also exhibited the tinted cheque papers in ordinary use by bankers, as well as another specimen of his manufacture called "Stone's patent cheque paper," the object of which is the prevention of fraud. The great improvement consists in rendering a paper perfectly resembling ordinary writing paper secure against the removal of ink by chemicals, as, on the application of the usual means for dissolving ink, the proof of its having been tampered with immediately becomes manifest, the paper becoming indelibly discoloured.

Two large transparencies were devoted to specimens of outline and shaded water-marks. In several of the designs great artistic skill and much taste were displayed—particularly in the view of York Cathedral, in which the elaborate architectural details of the front of that noble structure were accurately delineated; the St George and Dragon, after Wyon; and a copy of the "Wooden Bridge" in the Vernon Gallery. The gracefully flowing and delicate tracery of these subjects formed a very decided contrast to the antiquated figure of Britannia, so long and well known as the accompaniment to the sheet of foolscap.

TEBRAY'S WATER METER. Many plans for measuring the quantity of water supplied to the consumer by the water companies have, from time to time, been submitted to the Society of Arts, but, as yet, little has been done towards the introduction of the water meter by the great water companies of the metropolis. On the north side of the division appropriated to Machinery in Motion, was exhibited a compact and exceedingly neat contrivance for this purpose, invented and patented by Mr. Tebray, consisting of three main parts: first, a registering apparatus for ascertaining the quantity of water flowing through the machine; second, a self-acting regulator to enable the instrument to suit itself to any pressure; and, third, a check-valve to prevent surreptitious use. The measuring or registering apparatus stands on a truncated column, and is furnished with a dial having a pointer to indicate the number of gallons and pints which have been drawn from the cistern in a given time: the inlet pipe passes through a horizontal flange, by which the machine is secured either to a table or shelf; the outlet pipe is connected to the back part of the registering apparatus. This meter may be placed at any part of the water-pipe, and at any altitude, and in any part of the building. Its action is certain, easy, and effective; and, however suddenly the pressure may be increased, or the flow of water through it impeded, or altogether stopped, there is not the slightest concussion or reaction. Another great advantage worthy of being mentioned is, that it cannot be tampered with without detection. This apparatus, it appears to us, would be equally available as a check upon the consumption of other fluids, as beer, spirits, &c.

MAP CUPOLAS.—The *Builder* announces that the Exchange at Antwerp, is to be surmounted by a cupola of glass and iron, so arranged as to represent a map of the globe. The lines of latitude and longitude are to be formed by the bars, between which coloured glass, representing the map, will be inserted. The time is, in all probability, not far distant, when the tops of our houses may, with every chance of durability, be glazed so as to answer the purpose of conservatories. The price of iron and glass at the present moment would seem to favour the suggestion.

STRUGGLES AND DISAPPOINTMENTS OF GENIUS.—Several instances are on record of inventions having remained unnoticed and unrewarded in England. It is sufficient to mention the fly-shuttle, which was not introduced into the weaving of cotton till more than twenty years after its invention; and the apparatus for spinning by machinery, said to have been invented by a Mr. Wyatt of Lichfield, so early as the year 1733, but of which not even a model now remains.

"William Lea, a clergyman, invented the first stocking-machine in 1589, and made a pair of stockings by his frame in the presence of James I. His invention was discountenanced, upon the plea that it would deprive the industrious poor of their subsistence. He went to France, where he met with no better success, and died at last of a broken heart."

GODFREY DE BOUILLON.—M. SIMONIS

The CRYSTAL PALACE AND ITS CONTENTS

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

PARIAN—THE PLEIADES ADORNING NIGHT, &c.—MESSRS. ROSE & Co.

POTTERY, PORCELAIN, TILES, &C.

I.—GENERAL HISTORY AND DESCRIPTION OF CERAMIC MANUFACTURES.

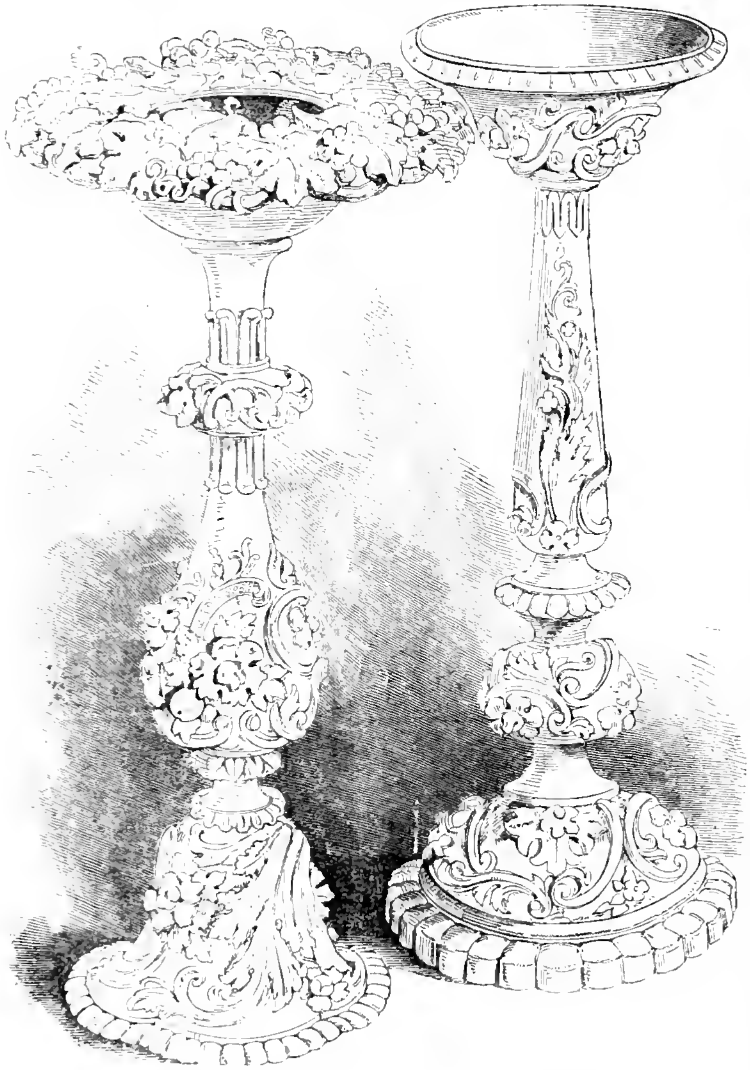
THERE was no section of the great museum of industrial products which presented to the attention of the intelligent visitor attraction stronger and more peculiar than that devoted to the ceramic* manufactures, including porcelain in all its varieties, oriental and European, earthenware, stoneware, flintware, faience, delf, ironstone-ware, terra-cotta, bricks, tiles, and in general every form of baked earth used in the arts and sciences. Moreover, there is, perhaps, no art in which the ultimate results differ so immeasurably from

* This is a word only recently introduced, and not yet universally adopted, as a generic term including all manufactures of potter's clay. It is derived from κεραμος, the greek for potter's clay. One of the quarters of the city of Athens, on the south-west side of the Acropolis, was called Ceramicus: and although Pausanius assigns a different derivation, Pliny relates that it was so called from the manufactory of Cholcostrius, a celebrated modeller of statues in clay.

No. 10, DECEMBER 6, 1851.

PRICE ONE PENNY.

the original materials as in this. What can more powerfully excite our wonder and admiration at the value which labour and art can confer on the basest materials than to reflect that the beautiful portraits in Sèvres porcelain of the Queen and Prince Albert, after Winterhalter, and the magnificent vases both in the British and foreign collections, are composed of nothing more than so many lumps of a whitish clay, and a collection of the rusts (oxides) of certain metals, all beyond this being the work of art. Another circumstance which confers peculiar interest on this section of the exhibition is the extraordinary rivalry which it has developed among different countries, and the unequal conditions under which British industry enters into this competition. Seven imperial and royal establishments for the manufacture of porcelain, supported by State subsidies, and encouraged by State patronage, had sent their choicest productions to be



PORCELAIN AND EARTHENWARE FLOWER-STANDS.—SMALL AND MALING.

displayed beside those of the unpatronised, unsubsidised enterprise, of Staffordshire and Worcestershire. Thus we have in the French department a magnificent collection of the finest pieces of porcelain from the National (late Royal) manufactory of Sèvres. A similar collection was sent from the celebrated Royal porcelain works of Meissen, near Dresden. The Royal porcelain manufactory of Berlin and the imperial porcelain manufactory of Vienna each sent a rich collection of its respective products. Besides these, the royal manufactories of porcelain of Copenhagen and Nymphenburg, near Munich, and, in fine, the imperial porcelain works of St. Petersburg, severally unfurnished their museums and transferred their richest treasures of art to the Crystal Palace.

The fabrication of ornamental porcelain in the several national establishments is conducted irrespectively of commercial profit. If any expedient for the improvement of the art be proposed to a British manufacturer, he must necessarily consider the probable cost of trying it, and the probable loss in the event of its failure. These considerations are, however, disregarded in establishments supported by the State, and every expedient for the improvement of the art presenting the slightest probability of a successful result is tried. All that is most eminent in science in each of the States above mentioned is brought to bear upon the improvement of the ceramic art. Besides pecuniary emolument, personal honours and rewards are lavished on all who contribute to its advancement. Thus we find at the head of each of these establishments, as well as at the head of each of their departments respectively, individuals who have attained the greatest eminence in those sciences which are more immediately connected with the ceramic art, and personal honours and distinctions, such as orders of knighthood, decorations, crosses, &c., lavished upon them as a further stimulus to exertion.

The Antiquity of the Ceramic Art renders it an object of especial interest. Every one is familiar with the allusions to the potter's wheel in the Old Testament, and these indications of the prevalence of the art at an early epoch in the history of the human race are abundantly confirmed by the annals of oriental nations, and by the material evidence of vases of baked earth which have been found in ancient tombs, and which are preserved in the national collections.

Among the objects exhibited in the Chinese department was a complete collection of the various materials employed at the great porcelain works of Kiang Tiht' Chin, as it is named in the catalogue, otherwise, according to better authorities, King Te Tching. This collection consisted of specimens of the plastic clay of which porcelain is formed, and of the various colouring matters with which it is decorated.

The place from which these specimens were sent is the seat of a very ancient manufactory of porcelain. Father Entrecolles, a French missionary, resided there in the beginning of the last century, and he states in his letters (published in Paris in 1741) that there were in operation at this place in 1712 not less than 3,000 ovens, which gave the town during the night the aspect of a vast furnace with a multitude of chimneys. It is impossible in reading his description not to be reminded of the appearance of certain parts of Staffordshire at night. During the residence of this missionary ancient pottery was in great demand, and bore extraordinary prices in China. The vessels obtained in tombs and other ruins bore marks of high antiquity. Thus it is related that vases were found which bore evidence of having belonged to the Emperors Yao and Chun, who reigned 2357 B.C., and 2255 B.C. In further corroboration of this, examples are produced of vases of Chinese origin found in ancient tombs at Thebes, which appear by their inscriptions to have been fabricated eighteen centuries before the Christian era. Several such vessels have been found. Mr. Wilkinson took two to England, one of which is in the British Museum, and another is in the museum at Alnwick. It was not, however, until a comparatively recent date that the fine porcelain, afterwards so celebrated, and so much esteemed in Europe, was fabricated in China. It was only under the dynasty of Song, from 960 to 1278 A.D., that porcelain began to be manufactured of fine materials, and to acquire that degree of perfection which has since been so much admired.

The fine porcelain of China was first imported into Europe by the Portuguese, in 1518, and for 200 years after that time Europe continued to derive its entire supply of that article of luxury from China. This fact is the more remarkable when it is considered, as will presently appear, that the material for the fabrication of china existed in unbounded quantity, and of the finest quality, in almost every country of Europe. The merit of the discovery of the materials and the art of fabricating fine porcelain in Europe is due to Saxony, and the first manufactory at which this article was fabricated was that which has since been so celebrated as the Royal manufactory of Meissen. The history of the origin and progress of this manufactory is curious, but, before relating it, it will be necessary to explain some circumstances connected with the process of manufacture of pottery in general.

General Description of the Manufacture.—All pottery is formed of plastic clay, which, being shaped into the vessels desired to be produced, is hardened by baking, and rendered impervious to water by being covered with a glaze, which also resists acids and other chemical agents to which it may be exposed. The clay possessing the necessary qualities being mixed with a certain quantity of water, and well kneaded, is reduced to a mass resembling common dough. The desired form is given to it either by turning, moulding, or casting. The instrument by which it is turned, called the potter's lathe or wheel, consists of a small circular stage placed horizontally, and supported on a vertical shaft, to which rotation is imparted. When the doughy mass is placed upon this stage, and put into rapid revolution, the hand of the potter is applied to it, and it undergoes an operation resembling that of turning in the common lathe. In this manner all circular forms are produced. Vessels, and the parts of vessels, which are not circular, such as the handles, spouts, feet, &c., are produced by moulding or casting, and are afterwards attached to the vessels which have been formed upon the lathe, as already described. The surface of the vessels thus formed is rough, and the texture of the material more or less porous, so that it would imbibe any liquid which might be poured into it. To prevent this, and to give greater beauty and durability to the article, it is dipped into a liquid of creamy consistency, which holds in suspension some substance capable of vitrifaction. After immersion, a coating of this creamy liquid adheres to the surface of the vessel. The water which holds the vitrifiable substance in suspension is partly imbibed by the material of the vessel. The vessel thus coated is placed in an oven, and again exposed to the action of heat of sufficient intensity to vitrify the coating with which it is invested, so that when withdrawn from the oven the coating is converted into a true glass, and the vessel is said to be glazed. In the coarser sorts of pottery, the material of which is red or brown clay, the glaze is coloured and opaque, so that the vessel coated with it takes the colour of the glaze,

the clay composing it being concealed. In the finer earthenware, the material of which is white clay, the glaze is generally colourless and perfectly transparent, so that after vitrification the surface of the earthenware is seen through the glaze, which is, in fact, nothing more than a coating of transparent and colourless glass. Sometimes a pattern in colours is made upon the surface of the article before the glaze is produced upon it. In such case the pattern is seen through the glaze, and is preserved by it. In other cases, however, the ornamentation is made after and upon the glaze. The colouring materials with which the ornamentation is produced are metallic oxides. When the pattern or design has been drawn upon the surface, the article is again submitted to the agency of fire, by which the colours which have been laid upon it are not only vitrified but changed in their tints. It is therefore necessary that the manufacturer should have the skill to foresee the effect of fire upon his colouring materials. In this he often errs, and is therefore obliged to retouch his work, and submit it a second time to the oven before it can be regarded as finished.

Early European Manufactures.—The first attempts made in Europe to fabricate a hard earthenware covered with a coloured glaze are ascribed to the Moors of the Spanish Peninsula in the 13th century. After this the manufacture was established in the island of Majorca, where it was carried on upon a considerable scale. In the 14th century a manufactory of earthenware, which afterwards obtained considerable celebrity, was erected at Faenza, in the States of the Church, where a commerce in stoneware was carried on upon a considerable scale, and from which that description of ware came to be known in France and on the continent by the name of "Faience." This ware was, however, made of a red clay, and was necessarily coated with a coloured and opaque glaze. After some time it was imitated with considerable success, and was much improved both in France and Holland. A manufactory was established by the celebrated Bernard de Palissy, at Saintes, in France, and another, on a not less considerable scale, at Delft, in Holland. From this latter place large exportations of this ware were made to England, whence it came to be called in this country "Delft." During this period considerable improvement was made in its manufacture, a white plastic clay being discovered, and substituted for the red clay of Faenza, and a transparent colourless glaze substituted for the opaque and coloured coating already mentioned.

First Establishment in Staffordshire.—About the middle of the 17th century a small factory for the manufacture of pottery was established at Burslem, in Staffordshire. In the year 1690 the manufacture carried on at this place was considerably improved by the Messrs. Elers, who had immigrated there from Holland, bringing with them the knowledge, skill, and experience of that seat of the art. There were at this time about 22 ovens at Burslem. The Messrs. Elers had not long been there before they discovered in the neighbourhood a bed of clay of very superior quality, and, erecting upon the spot itself a factory, resorted to extraordinary and curious measures to keep in profound secresy their materials and their processes. With this view they not only excluded most rigorously from their works all visitors whatever, but selected for their operatives the most stupid and ignorant persons they could find, and so divided the labour that no one individual possessed more knowledge than that of the very process at which he was employed. These precautions were, however, of little avail. The stimulus of profit and the spirit of enterprise are not to be repressed by such shallow expedients. A workman named Twyford imposed upon them by affecting indifference to the art, and managed to get admitted to their employment. He soon discovered some of their secrets, but it remained for another more astute and persevering person to discover all the details of their processes. An individual named Astbury, appreciating the importance of the manufacture, and foreseeing the profits likely to arise from it, decided on adopting a course and persevering in it which, as he imagined, and as proved by the event, would lead to a complete discovery. He affected the manners of an idiot, deceived them, and got into their employment, and was adroit enough to sustain the deception for several years, until he became complete master of their secrets. After this the Messrs. Elers left Staffordshire in apparent disgust, and settled in London, where, at a later period, they were probably instrumental in establishing the well-known porcelain works at Chelsea.

This was the origin of the celebrated Staffordshire Potteries, now a hive of industry, covering an area eight miles in length and six in width, and employing 70,000 operatives, a large proportion of whom belong to the class of skilled labour, and no inconsiderable part to the highest order of art. It is here we may find the splendid establishments of Messrs. Copeland, Minton, Wedgwood, Alcock, Pratt, Mayer, Boote, Mason, and others, whose productions enriched the gallery of the northern transept of the Exhibition.

One of the ingredients of fine pottery is silica, or the earth of flints. The circumstance which led to the application of this substance to the art is thus related:—Mr. Astbury, the son and successor of him who gained the knowledge of Elers's secret by feigning idiocy, being on his road to London, and making the journey on horseback, was stopped at Dunstable, in consequence of his horse being attacked with a malady of the eyes. The innkeeper at whose house he put up advised him to apply a poultice of calcined flints. Astbury observed that the flints, which before calcination were black, were by this process converted into a white substance. It occurred to him that he might bleach the clay of his pottery by mixing it with the substance, which thus became white in the fire. He accordingly realised this with complete success, and afterwards silica became a regular ingredient of pottery.

Notwithstanding the progress thus made between the ninth and the sixteenth century in the manufacture of pottery throughout Europe, China still continued to be the exclusive source from which the finer sort of earthenware came, so that this ware acquired, and still retains in England, the name of "china," being distinguished, however, on the continent, from the inferior sorts of earthenware by the denomination of "porcelain." The origin of this term "porcelain" is uncertain, but is supposed to proceed from the Portuguese word *porcellana*, signifying a drinking cup.

After what has been related above of the efforts made in every part of Europe to improve the manufacture of pottery, and the high estimation in which the porcelain of China and Japan was everywhere held, and the high prices at which it was generally purchased, it may well be understood that extraordinary means were resorted to by private industry, and extraordinary inducements offered by the Sovereigns of Europe in the shape of rewards and honours, for the discovery of the means of fabricating these precious wares. The processes of turning, moulding, and casting, of baking and glazing, being all known, the great desideratum which remained was the clay, now called china clay. This material had, up to the time we now refer to, never been found in any part of Europe, although, as will presently appear, it could be obtained everywhere. This clay, which in China is called "kaolin," a name which has been adopted also in Europe, consists of silica and alumina in variable proportions. When the clay has been exposed for a short time to a certain temperature this substance undergoes a chemical combination, the result of which is silicate of alumina, but it rarely or never happens that in any kaolin these two principles are found in the proportions which they combine chemically; one or other is always in excess, and the result is consequently not an absolute silicate.

The kaolin of Aue, discovered by the accidental circumstances we have related, continued and still continues to be used as one of the materials of the Saxon porcelain. Two sorts of paste are at present used in this manufacture. What is called the service paste, or that used for porcelain in general, is composed as follows:—

Kaolin of Aue	18
Kaolin of Sosa	18
Kaolin of Seilitz	36
Feldspar, &c.	28
	100

II.—Dresden China.

We have already stated that the first discovery of the precious and long sought for material, which was soon destined to throw into the shade even the Chinese porcelain itself, was made in Saxony. The circumstances which led to it are curious and interesting, and highly characteristic of the spirit of the age, and of the interest which this manufacture excited.

An individual named Bottger, the apprentice of an apothecary at Berlin, rendered himself notable by his reputed skill in alchemy, pretending, and probably believing, that he was engaged in extraordinary researches which promised to lead to the solution of the grand problem of the transmutation of metals, and consequently to that of the fabrication of gold. These researches and pretensions gave him the title of the *Maker of Gold*.

The reports of his proceedings and his reputation excited the attention of King Frederick William I., who manifested such an interest in them as alarmed Bottger for his personal safety. Fearing that the king might seize his person with a view of extracting from him his secret, or at least of turning to his Majesty's exclusive profit his labours, Bottger fled from Berlin and took refuge in Saxony. The King of Prussia having caused him to be pursued, he was arrested at Dresden; but Frederick Augustus I., King of Poland and Elector of Saxony, having also some faith in the reputed discoveries of Bottger, and desiring himself to retain possession of the *Maker of Gold*, resolved not to surrender him, and consequently caused him to be conducted to Wittenberg. He was destined, however, only to exchange one captivity for another, for the Elector, while he supplied him most liberally with all the means of pursuing his chemical researches, and contributed by every means to his personal comfort and well-being, had him kept under the most strict surveillance, and, in fact, he was subject to something approaching to solitary imprisonment.

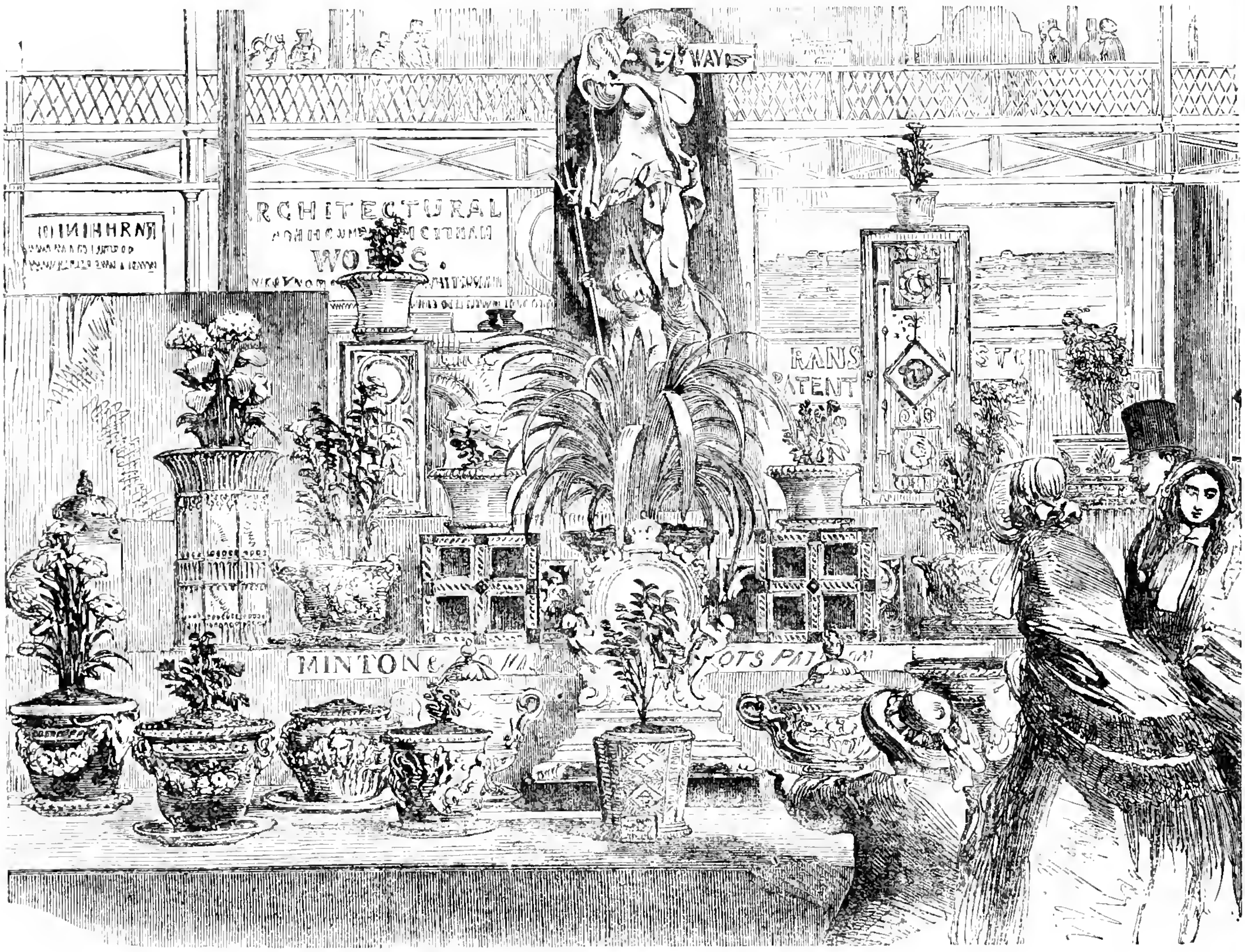
These events took place in 1701. The king, after a time, finding that no results proceeded from the experiments of Bottger, and perhaps ceasing to have faith in them, put him in communication with a certain Tschirnhaus, who had been engaged in experimental researches relating to the fabrication of porcelain. He thought it probable that the skill and knowledge which failed in the solution of the problem for the transmutation of metals might probably be turned to account in the more practicable problem of the fabrication of porcelain. Tschirnhaus accordingly dissuaded Bottger from pursuing a course of inquiry likely to be so barren as that in which he had been so long and so vainly engaged, and allured him by the prospects of wealth and distinction to co-operate with him in a series of experiments having for their object the discovery of the composition of the clay or paste of which the porcelain of china was composed.

Tschirnhaus had already discovered a clay in the neighbourhood of Dresden, of which he succeeded in making an earthenware, which was dense, compact, and hard, but red in its colour, and possessing not the slightest transparency. It had none of that translucency, whiteness, and fineness of grain which characterised the Chinese porcelain: it was, in fact, nothing better than a fine red ware; nevertheless, it had considerable vogue.

In order that he should be more effectually withdrawn from the observation of the curious, the Elector established Bottger, with Tschirnhaus, in the chateau of Albrechtsburg, at Meissen. A laboratory and workmen were there provided for Bottger by the Elector. He was supplied with everything which could render his life agreeable, including a carriage for his use, but he was still kept under incessant surveillance. Whenever he went out an officer accompanied him, who never for a moment lost sight of him, lest he should escape, taking with him his secrets. In 1706, Charles XII., King of Sweden, entered Saxony. The Elector, fearing that Bottger might be seized and taken away on this occasion, caused him to be conducted with Tschirnhaus, and three of his principal workmen, under an escort of cavalry, to the fortress of Kœnigstein, to which his laboratory was also transferred. He was there subjected to a still more rigorous surveillance.

At this time hairpowder was in universal use, and formed an important article of commerce. A rich ironmaster of Erzgebirge, named Schnorr, happened in 1711 to be passing on horseback along a road near Aue. He observed the road to be covered with a white and soft clay, which formed a tenacious mud, from which his horse raised its feet with difficulty. It occurred to Schnorr that an earth so white, when calcined and prepared, might be converted into a mineral hairpowder. He accordingly brought home with him a sample of this clay, and, having subjected it to certain processes, produced from it a fine white powder, which he afterwards fabricated on a large scale, and in which he established a considerable commerce at Dresden, Leipsic, Zittau, and other principal places.

Bottger, like others, wore a wig and used hairpowder. Happening one day to take in his hand the packet of powder supplied by his valet, he was



MAJOLICA VASES, WALL-TILES, ETC.—MINTON & CO.

After a year's seclusion in this fortress, he was reconducted to Dresden on the 22nd of September, 1707, where he was established with a new laboratory, which the Elector caused to be prepared for him in the Jung Ferbastei. Here Bottger and Tschirnhaus renewed their labours for the improvement of porcelain, and especially for the discovery of some means of making the porcelain of China. The researches were long and fatiguing, often occupying entire nights; and it is related that Bottger frequently found it necessary to watch incessantly the operation of baking for three or four days, night and day, during which he and his companion were compelled to keep incessant watch.

The Elector took a deep interest in these proceedings, so much so, that he frequently himself assisted personally at them, and was present during the baking of the porcelain, and witnessed its being withdrawn from the ovens. Still the result of these labours was not a true porcelain: it was still a reddish stoneware, which acquired the brilliancy of porcelain either by being polished upon the wheel of a lapidary, or by means of a glaze produced upon it at a low temperature.

Tschirnhaus died in 1708, and a short time afterwards accident, which proves to have played so important a part in the history of porcelain, brought to the knowledge of Bottger the kaolin, or china clay, which afterwards conferred such celebrity upon the Dresden porcelain.

struck with its extraordinary weight; he inquired whence it came, and ascertained that it was the new mineral powder, and not the vegetable powder which had been previously in general use. It occurred to him that an earthy matter of this whiteness might probably serve the purposes of porcelain clay, and he immediately subjected a quantity of it to experiment, and found it answer perfectly. Inquiries were now instituted respecting its origin. Schnorr was applied to, and the place at Aue where he obtained the powder was ascertained. On examination, this place proved to be a vein of fine kaolin, identical in its properties with that which constituted the material of the porcelain of China. This clay was then known in commerce as the *white earth of Schnorr.*

When these facts became known to the Elector its exportation was strictly prohibited under the most severe penalties, and it was transported to the porcelain works of Bottger, by sworn agents and in sealed barrels. The most extraordinary precautions were taken to maintain the secrecy of the use of this earth in the fabrication of the Dresden china. The first condition imposed upon the persons employed in the works, from the highest to the lowest, was *secrecy till death!* Whoever betrayed any of the secrets was menaced by the king with imprisonment for life in the fortress of Kœnigstein. Such was the origin of the Dresden manufactory of porcelain, which has since obtained a world-wide celebrity. *(To be continued.)*

GROUP OF CHINA.—DANIEL.

ILLUSTRATIONS IN PORCELAIN.

THE Engraving on our front page, represents a collection of beautiful works in Parian, by Messrs. Rose and Co., of Coalport. The principal group representing the "Pleiades adorning Night" is very elegantly treated. On either side are ornamental works in the same beautiful material, of very pleasing design.

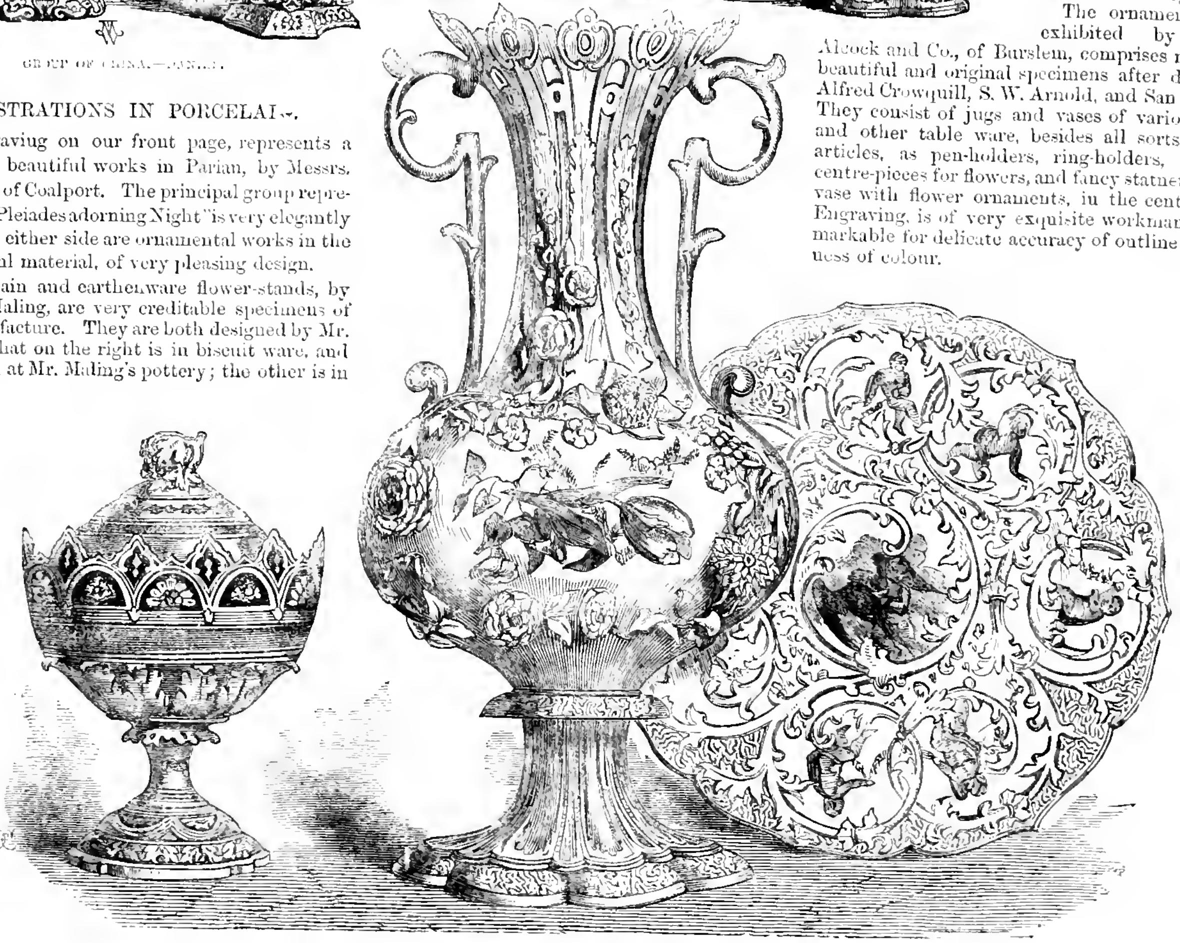
The porcelain and earthenware flower-stands, by Small and Maling, are very creditable specimens of British manufacture. They are both designed by Mr. T. Small. That on the right is in biscuit ware, and was produced at Mr. Maling's pottery; the other is in fire clay, manufactured by Mr. Addison, potter, of Wellington Quay, Newcastle-upon-Tyne. The former material, although beautifully white, is not serviceable, except for articles of luxury of which great care can be taken; fire clay, on the other hand, is a substitute for stone, and will stand the same rough usage.

The majolica vases, flower-pots, tiles, &c., by Minton & Co., exhibit a modern application of a very ancient style of earthenware manufacture, the peculiarity of which consists in glazing coarse material with a fine opaque glaze. For a very long period, the manufacture, which was confined to Italy, has been extinct, and, during its existence, was applied to such articles as wine coolers, dishes, vases, &c., which were painted in the highest style of art, and so well, that it is matter of dispute whether some were not from the hand of Raphael, and it is quite certain they were of his school. The manufacture took its name from the island of Majorca, where it was probably of Spanish origin.

The figure of Gelatea in *terra cotta*, life size, was modelled by a French artist, who holds the situation of master of the model class in the Government School of Design at Stoke.

The group of china exhibited by Daniel was manufactured by Messrs. Rose, and displays, amongst other remarkable features, the beautiful colour, intended as the revival of the celebrated *Rose du Barry*, for which the Sevres Manufactory was once celebrated. The designs are tasteful and elegant.

The ornamental china exhibited by Messrs. Alcock and Co., of Burslem, comprises many very beautiful and original specimens after designs by Alfred Crowquill, S. W. Arnold, and San Giovanni. They consist of jugs and vases of various forms, and other table ware, besides all sorts of fancy articles, as pen-holders, ring-holders, ash-trays, centre-pieces for flowers, and fancy statuettes. The vase with flower ornaments, in the centre of our Engraving, is of very exquisite workmanship; remarkable for delicate accuracy of outline and richness of colour.



GROUP OF CHINA.—ALCOCK AND CO.

MINING AND METALLURGY.

GENERAL ACCOUNT OF MINING OPERATIONS.

THE external crust of the globe is in many localities traversed to a considerable depth by rents, or fissures, which were probably produced by great convulsions of nature, occurring at some remote period. These are sometimes found to be filled up by the trachean, or porphyritic, rocks, by the uplifting of which the fissures were first caused; whilst, in other instances, they contain various metals, either in a free state or in different forms of combination with other bodies. In the former case, these clefts are known by the name of dykes, but when they contain metallic ores they are called lodes, or mineral veins. Deposits of this kind chiefly occur either in the primitive rocks or in the transition formations in their immediate vicinity, and in such localities the greater proportion of our most valuable and productive mines will be found to be situated.

Mineral veins are frequently nearly perpendicular in their direction, although they sometimes possess considerable inclination. Generally speaking, a vein may be considered as a plane, of which the extension in length and depth is unknown, as the former is commonly bounded by a contraction too small to induce the miner to follow it, whilst the latter is often greater than that of our deepest mines. It seldom happens that an isolated mineral vein is found in any locality, and, with but few exceptions, where one lode has been discovered it may be safely inferred that others exist at no considerable distance. It also most frequently occurs that the whole of the lodes in the same neighbourhood assume a nearly similar direction: and if two distinct systems of veins should be found in the same district, those running in one direction, if metalliferous, yield a different metal from those which do not follow the same course.

The composition of a mineral vein appears moreover to be somewhat affected by the nature of the rock through which it passes, as certain minerals are found to exist in large quantities in that portion of a lode which passes through one kind of rock, whilst the same vein, when traversing a different geological formation, may be entirely without any traces of the ore. As a general rule, however, those veins are found most productive which are situated in the immediate neighbourhood of the junction of two different species of rocks. In Cornwall, where a large proportion of the mineral riches of this country are obtained, all the most productive mines are situated near the point of meeting of the granite and killas, or clay-slate.

Besides occurring in lodes, the metalliferous minerals are also found deposited in regularly stratified beds, as well as in irregular masses; but, with the exception of the ores of iron, the metallic minerals are almost exclusively raised from regular veins. The ores of iron, like those of the other metals, are sometimes extracted from regular lodes, but they are chiefly deposited either in distinct strata, as in the case of the black-band iron stone of the coal districts, or exist in irregular deposits, frequently produced, as in the case of the various oolitic iron ores, by ferruginous infiltrations. Besides these more ancient deposits, it frequently happens that the valleys in the neighbourhood of metalliferous rocks have become, in the course of a long series of years, partially filled up with sands washed from the surrounding mountains and other high ground, and which are found to contain a portion of the metallic riches of the hills of which they originally formed a part. In some districts such deposits are extremely numerous, and yield, by washing, large quantities of various metals.

In Cornwall most of the valleys in the tin districts produce sands containing the peroxide of that metal, which is extracted by subjecting them to a stream of water, when the greater density of the tin ore causes it to remain in the current, whilst the lighter substances with which it is associated are carried away by the stream, and in this way separated from it.

In Borneo, large quantities of tin ore are thus obtained, and the extent to which these operations are carried on may be imagined when it is stated that as much as 3500 tons of this metal have in one year been exported from this island alone. In other cases, gold and silver in the virgin state are distributed in small grains in these sands; and this is, in fact, one of the chief sources of the precious metals.

The sifting and washing of such sands furnishes to Russia the greater part of the gold produced in that empire, which annually amounts to about fifteen thousand pounds weight. Russia also obtains by the same process an annual supply of nearly five thousand pounds weight of platinum, which is almost entirely extracted from the streams flowing from the range of mountains which separate Siberia from Tartary.

The mineral riches of a country are frequently discovered by means of the fragments of rock brought down into its valleys by the action of water; and on tracing these to their several sources, the veins from which they were originally detached are, in many instances, discovered. Water also performs, in another way, a very important part in the discovery of mineral veins, as, by closely observing the faces of the different gulleys which may intersect a mountainous country, a ready method is afforded of exploring the mineral wealth of its several strata.

When the substance of a mineral vein is harder than the rock in which it is situated, the latter is sometimes, by the combined action of air and water, to a considerable extent gradually removed, whilst the lode itself remains as a sort of natural wall across the country in which it occurs. A remarkable instance of this kind is to be seen at Mouzias, in Algeria, where several lodes, principally composed of spathose iron and sulphate of barytes, are thus denuded.

When neither of the above methods of observation are available, it is necessary to examine the nature of a district through the medium of artificial excavations. This is done by what is called by the Cornish miner shoding or costeaning. When the general direction of the lodes of a neighbourhood has been determined from the facts elicited during the working of other mines in the district, a series of pits is sunk as nearly as possible at right angles to the assumed run of the mineral veins. These pits are about three feet in width, six feet in length, and extend in depth through the alluvial deposits a few feet into the subjacent rock. In order to avoid the chance of missing any lode which may occur in the superficies to be examined, such pits are sunk at regular distances, and are united by galleries from one to the other, which would necessarily traverse any veins that might have escaped detection in sinking the shode pits themselves. If the direction of the lodes of the neighbourhood is not known, or if it be uncertain whether the country be traversed by mineral veins, it is necessary to arrange two series of pits at right angles to each other, by which means, if any occur, they cannot readily escape detection.

When a lode has been discovered, and when it is found to contain a valuable mineral, or presents appearances from which it may be inferred that it will prove productive of ore at a greater depth, the first operation, if the conformation of the country admit of it, is usually to drive an "adit level." This is a gallery cut a little above the level of the nearest valley in such a way as to intersect the lode at a certain distance from the surface, and draw off the water from the higher portions of the vein. Should the appearance of the lode then prove favourable, a pit or "shaft" is sunk in such a position that it may intersect the mineral deposit at a given distance from the surface, and serve as a means not only of extracting the minerals which it may contain, but also as a passage, by which the workmen may descend into the mine.

Should the lode, after proper examination, prove to be productive of ore, other shafts will be sunk, and a regular series of levels driven. In the first place, galleries will be excavated in the substance of the vein itself, for the purpose of extracting its contents; these are, in the Cornish mines, generally placed at distances of ten fathoms from each other, and are connected with the shaft, through which the excavated ore and rock are conveyed to the surface. The lode, however, being a diagonal plane, can only be traversed by a perpendicular shaft in one particular point, and it is consequently necessary that each of these levels should be connected with it by a gallery perpendicular to the general run of the lode. These are called "cross-cuts," and are commonly furnished with railways, for the more ready conveyance of the contents of the vein to the pit by which they are transported to the surface.

The water which percolates into the mine, below the point at which the adit-level meets the shaft, is drawn out by the agency of a series of pumps, worked either by water-power or a steam-engine. For a short time after a shaft has been commenced, and before it has attained any considerable depth, the rubbish removed is conveyed to the surface by a simple windlass moved by manual labour. When, however, the pit has reached a certain depth, a contrivance called a "whim," or "gin," moved by horses, is frequently employed, although steam power is now daily becoming of more common application.

The tools employed by the miner necessarily vary according to the nature of the ground which he has to traverse. If the rock be moderately soft, nothing but an ordinary pick and shovel are used, but if it be hard, and is either stratified or contains numerous fissures, he has recourse to steel wedges or points, called "gads," by driving which into the crevices of the rock he is enabled to split off larger portions than he would be able to detach by means of the pick alone. When the ground to be cut through does not admit of being thus broken, the working is effected by the assistance of gunpowder, which is exploded in holes cut to a considerable depth in the rock. This is done by the aid of an iron instrument called a borer, armed at one of its ends with a steel bit, provided with cutting edges. To use this tool one of the miners holds the sharpened end to the rock to be pierced, whilst another hits the opposite extremity a heavy blow with a large hammer or "mallet." As the hole deepens, the person who holds the tool turns it between each blow about a quarter of a revolution, and by this means a deep hole is ultimately obtained.

The borer is from time to time removed from the hole during the operation, in order to take away the crushed portions of rock, and a little water is added, for the double purpose of cooling the borer and facilitating its action. When the hole has attained to what is thought a proper depth —which necessarily varies with the nature of the rock—it is carefully

cleaned out, and a quantity of coarse powder is deposited at the bottom. To confine the powder, and thereby give greater force to its explosion, the hole is now filled up by ramming in a quantity of soft schist, called "tamping," a small hole being left by the use of a copper needle, which is subsequently withdrawn, to afford means of igniting the charge when required. The ancient method of doing this was by a reed or rush filled with fine powder, which was let down into the hole, and which served as a channel for the spark to be communicated through the medium of a slow match, during the burning of which the miner had time to escape out of danger.

Recently these rude and dangerous contrivances have been almost entirely superseded by the use of Bickford's patent safety fuse, which not only itself acts as a slow match, but has also the great advantage of being safer, and, at the same time, more readily used. This fuse consists of a hempen tube, made water-tight by a covering of resinous or pitchy matter, and filled with a composition which, when once united, burns with a certain fixed rapidity, until it reaches the charge of powder which it is designed to explode. A specimen of this fuse was exhibited by the inventor, coiled around a large reel on one of the tables which extended down the centre of this section.

Considerable improvements in the arrangements for boring and blasting rocks have lately been made by Mr. Rogers, of Abercarn, who illustrated, by drawings and a series of tools, his process as adapted to the sinking of shafts through solid and extremely hard ground.

It has been often noticed that, since the application of gunpowder to blasting purposes, little improvement has been made in the methods adopted for cutting through hard rocks; and the great expense of maintaining engine-power for pumping and winding during the long periods occupied by these operations is still the sole reason why some of the best and richest mineral deposits in Great Britain remain idle and unproductive, besides being the principal cause of the serious loss of life which so often occurs from accidental explosions during mining operations.

In boring it is customary to employ a tool of which the body is made of wrought iron, whilst the bit, or end, only is of steel. No definite proportion between this iron stock, or handle, and the breadth of the bit, appears to have ever been preserved, and from this cause a very large proportion of the power exerted by the striker has been uselessly expended.

The tools used for this purpose by Mr. Rogers are made entirely of cast steel, and from their greater rigidity and superior hardness are found to be much superior to the ordinary borer, in which the shank is of iron, and common shear steel is employed for the bit. In the manufacture of these tools, it is found to be of the greatest importance that certain relations between the size of the bits and stocks, or handles, should be observed, in order that they may work freely in the bore, and at the same time spring as little as possible under the blows of the hammer. The following proportions have been found by experiment to answer these conditions:—

Diameter of Octagon Cast Steel.	Breadth of Face of Bit.
1 inch	$1\frac{1}{2}$ inch.
$1\frac{1}{8}$ "	$1\frac{3}{4}$ "
$1\frac{1}{4}$ "	2 "
$1\frac{3}{8}$ "	$2\frac{1}{4}$ "
$1\frac{1}{2}$ "	$2\frac{1}{2}$ "

The oldest method of sumping, or drawing up water from the bottom of a shaft during the process of sinking, was the Hogar-pipe, which was about four feet in length, and made of leather, stiffened by metallic rings. But the constant damage to which this was liable in blasting soon caused it to be almost entirely abandoned, and in its place was introduced an apparatus known as the stock and slide pipe, which consists of two cast-iron tubes sliding into each other as a telescope, and kept by a stuffing box perfectly tight in the joints. This contrivance, besides being very expensive and difficult to manage, is also liable to breakage during the blasting of holes; and as the sump can only be made directly below the pump-trees, it follows that during a great portion of the time occupied in sinking the shaft, two or three men only can be effectually employed, which, particularly when the shaft is of large size, causes considerable delay and inconvenience to those employed in sinking it.

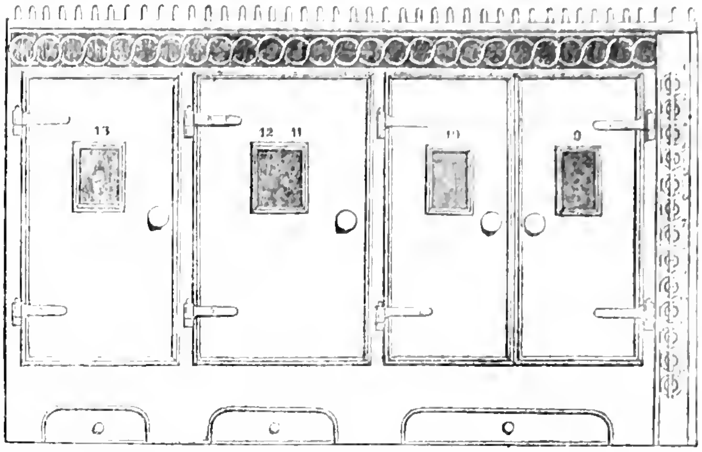
Mr. Rogers has substituted a gutta percha tube for the leather Hogar, or stock and slide, previously employed, and has found it less liable to accident and much more easily repaired than either of these combinations; it also allows of the sump-hole being made in any part of the shaft, and thus enables a greater number of persons to work in it at one time.

The greatest advantage has likewise been derived during these operations by the substitution of the galvanic battery in place of the ordinary methods of igniting the charges of powder which are to be exploded. By this apparatus any number of holes may be readily discharged at the same instant, the effect of which is to lift up and separate the entire mass of rock which is contained in the space between them; and three or four holes, if well placed, are found to produce more effect than double the number fired separately. By the use of this agent, perfect safety to the miner when blasting is also secured, as the circuit of the battery is not completed until the whole of the workmen have reached some place of safety.

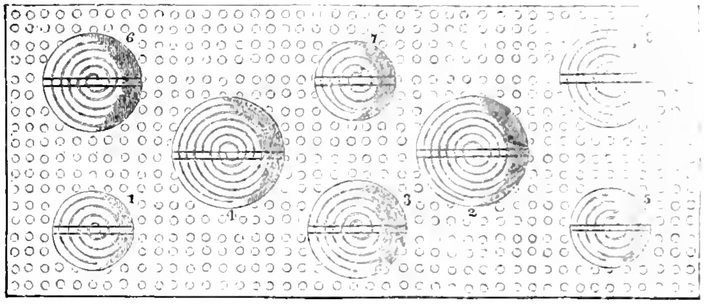
The extraction and preparation of mineral ores will furnish the subject of another paper, in which will be noticed the various improved machines for this purpose, which were exhibited on the different tables of this section.

KING'S GAS COOKING RANGE.

Mr. Strode exhibited a gas cooking range, which is constructed on a plan peculiar to the town of Liverpool. It was designed by Mr. King, chief engineer of the gas works of that town. It is divided into three compartments of different sizes for roasting and baking, being furnished

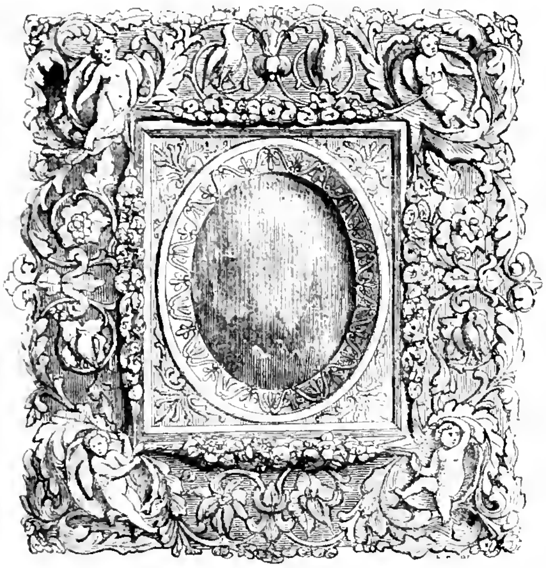


with a damper to regulate the flow of air through them. The burners arranged inside the oven, at bottom, around the sides, back, and front, with a dripping-pan occupying the centre. The meat is hooked on to a



sliding frame or carriage, which, when pushed in, allows it to be suspended surrounded by the gas. On the top of the range are eight spiral burners, in round well-holes, for boiling, stewing, frying, &c., any of which operations can be done with the same facility as on a hot plate or over a charcoal fire. The meat roasted by this range, owing to the regularity and certainty of the operation, is of a more nutritive character than that cooked by the ordinary process, as more of the juices of the meat are retained, which is ascertained by the comparatively small loss of weight after cooking. By the operation of broiling, twelve chops can be cooked at once, at a cost of not more than *twopence* per hour for gas, which gives at the rate of sixty chops at an outlay of only twopence for gas. Comfort and cleanliness to the cook, and economy to the consumer, are among the qualifications of this useful invention. The gas is lighted with a gas-torch, or portable jet of iron pipe, attached to a flexible pipe.

A German's Reflections on the Great Exhibition.—The *Vossische Zeitung* of Berlin, has the following remarks on the close of the London Exhibition:—"Human culture has made a mighty step forward, and in spite of all the apparent success of a reactionary policy, religious and political, it is not for a moment doubtful what the final result will be for the development of society. That peaceful assembly in the building of the Exhibition has done more to strengthen the feeling of self-consciousness, to discover defects in many branches of public activity, and for insight into the connection between political and material interests, than a thousand political clubs could have effected; and while at first fears were entertained of serious disturbances during the Exhibition from foreign exiles, it has been shown that hollow and abstract declamation remains totally powerless by the side of such a gigantic fact. In the building of the Exhibition the propaganda of reasonable progress, peaceful development, and independent energy erected its throne and made countless proselytes. This great event alone has sufficed to mark the year 1851 as an era in the history of nations: its memory will remain to distant ages powerful in its consequences, when the temporary pettiness and narrow wisdom of diplomatists shall long have found the oblivion they deserve. And if there are many who look round on the present with depressed glance and broken courage, when almost everywhere, and especially in Germany, we find discontent sprung from disappointed expectations, and indifference to the interest of the State, and censure of a system of government that is more founded on a strong police than a statesmanlike wisdom, the observation of this Congress of Industry will disperse many gloomy clouds, strengthen the conviction that the progress of nations is unceasing, and animate us to renewed and more self-confident exertions."



CARVED FRAME.—BARBETTI, OF TUSCANY.

"THE AGES OF LIFE."

THE QUEEN AND PRINCE OF WALES.—J. BELL.

THE QUEEN AND PRINCE OF WALES.

This statuette group of her Majesty and the Prince of Wales is from a design by Mr. J. Bell, and has been produced by the electrotype process, in a very effective manner, by Messrs. Messenger and Son.

CARVED FRAME, BY BARBETTI.

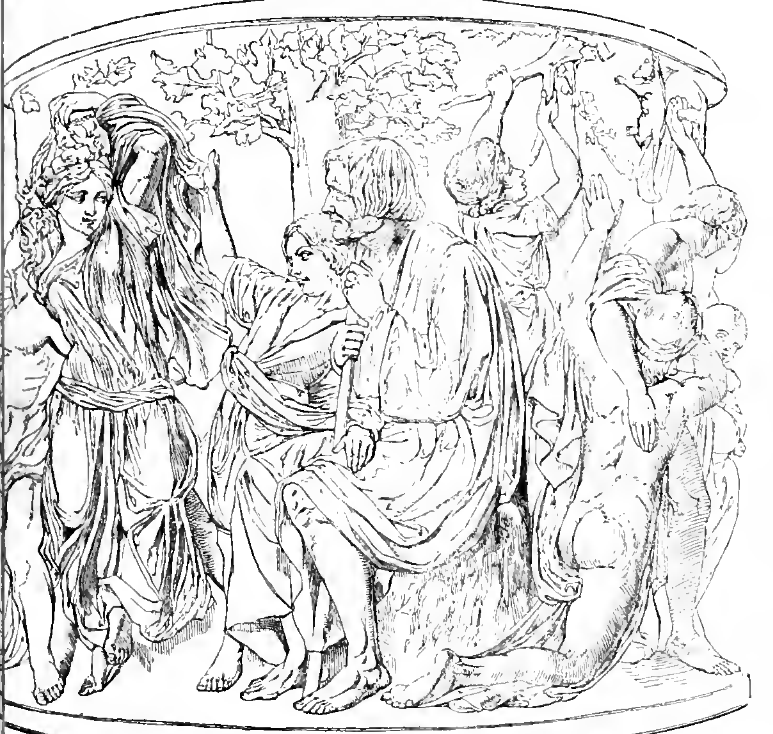
This is one of the very beautiful specimens of wood-carving from Tuscany, which we mentioned in our article on that subject in a former number. The foliage, and the little figures of Cupid, are alike exquisitely finished.

CARVED FRAME, BY ROGERS.

We have here one of Mr. Rogers' happiest productions in this line, the flowers being executed with a roundness and boldness of character which betray the hand of a master in his art. The portrait inserted is introduced by us for the purpose of heightening the effect.

SCULPTURED PEDESTAL.—F. DRAHE.

CARVED FRAME.—ROGERS.



"SOLITUDE," EXHIBITED BY THE ART-UNION.

SCULPTURED PEDESTAL. BY F DRAHE, OF BERLIN.

The above four Engravings give a representation of the bas-relief on the circular pedestal, by F. Drahe, being a plaster model of that which supports the monument erected by the inhabitants of Berlin to the late King, Frederick William III. It is a pleasing composition, composed of passages of gardens and rural pleasures—as a mother listening to the rippling of a brook; a young man and woman near a well; a boy trying to catch a squirrel which is running up a tree; girls with flowers; others feeding a swan; children at a bird's nest; and, throwing a hallowing sentiment over all, a patriarch resting on his crutch, and smiling benignly at the happy groups which surround him.

SOLITUDE.—EXHIBITED BY THE ART-UNION SOCIETY.

"Solitude" was one of the small plaster models sent in in competition for the prizes of 100 and of 50 guineas, offered by the Art-Union Society.

HISTORY OF INDUSTRIAL EXHIBITIONS.

IV.—Expositions of France in the Nineteenth Century.

Napoleon's commercial policy, extolled so often and so loudly for its penetration and completeness, was, however, marred by the force of his prejudice against England; since we find that while, on the one hand, he was endeavouring to encourage and elevate native industry by industrial exhibitions, and the establishment of gratuitous educational institutions, on the other hand, he could not forbear from the vindictive exclusion of English manufactures from the French territory. He prohibited the importation of British muslins, cotton cloth, both plain and coloured, and other cotton articles; while he subjected cotton thread to a heavy duty. After the close of the fourth official exhibition, in 1806, and the dispersion of the rival manufacturers who competed at it, a long interval succeeded, in the excitement of which, little attention could be bestowed upon the peaceful battles of rival industries.

After an interval of thirteen years, in compliment to the restored monarchy, as the last had been to the glory of the man now dethroned and disgraced, splendid galleries were raised in the Court of the Louvre to celebrate the *fête* of St. Louis, by assembling all that the skill and genius of the country could bring to swell the national pride in the excellences of native manufactures and arts. The great feature of this exhibition was the marked improvement in the manufacture of metal—a department of industry in which France was (and is) far behind other countries, as, for instance, England, Prussia, and Belgium. In 1806 the only foundry in France was that at Creusot; but in 1819 the furnaces of the Loire and other places sent excellent specimens of metal manufacture to the national exhibition. On this occasion, however, some admirable specimens of rolled iron from the forges of Grossonore were presented; and bronzes, stereotype plates, and other metal manufactures of delicate workmanship, attested, by the excellence of the specimens presented, that the French artisans who had escaped the wars had not rested from their labours.

This exhibition showed the rapid progress the country had made in the manufacture of steel, since exhibitors from no less than twenty-one departments showed excellent specimens of this commodity; and in every branch of manufacture where steel was used, most encouraging improvements were displayed.

In the machinery John Collier exhibited a model of his machine; and Jacquard (who, in the exhibition of 1801, gained a bronze medal) exhibited a model, which was highly eulogised by the authorities, and for which he was decorated. It is an encouraging sign of the times, that the children of the Lyonese who burnt Jacquard's machine have lately erected a statue to the memory of the inventor in one of their public squares.

The results of machinery about this time began to be properly appreciated, and manufacturers, taking advantage of the cheapened means of production, began to compete for cheapness, as well as elegance of design, and, by this means, to bring their manufactures within the reach of the great masses of their countrymen.

The labours of Daniel Kœchlin, of Mulhausen, which have tended so materially to bring the printed calicoes of France to their present high artistic excellence, bore some of their welcome fruits to the national exhibition of 1815. Dr. Ure, who visited M. Kœchlin's establishment at Mulhausen, reports that so profoundly had this eminent man studied his manufacture, more particularly with regard to the nature and properties of dyes, that he had in the laboratory attached to his establishment upwards of 3000 labelled phials, filled with chemical re-agents and specimens subservient to dyeing. The history of calico-printing, both in England and France, presents a moral which the histories of too many inventions unhappily furnish: viz., that it is childish and short-sighted on the part of a class to endeavour to impede the result of inventions for increased production. Not many years after, the merchants of Paris, together with those of Rouen and other districts, declared that "they came forward to bathe the throne with their tears on the inauspicious occasion" of the establishment of cotton fabrics upon a footing of equality with other industries. The Inspector-General of Manufactures appealed to the bodies still discontented in these terms:—"Will any of you now deny that the fabrication of printed cottons has occasioned a vast extension of the industry of France, by giving profitable employment to many hands in spinning, weaving, bleaching, and printing the colours. Look only at the dyeing department, and say whether it has not done more good to France in a few years, than many of your other manufactures have in a century!"

Other names of eminence occur in the report of the jury. Among the exhibitors who were decorated were Vitalis (the Kœchlin of Rouen); Raymonde of Lyons, who had invented a process for fixing a Prussian blue dye upon silk; Widmer of Jouy, who gave to the manufacturing world a green dye of immense value (for the invention of which a prize of 2000 guineas had been offered in England); Arpin, the muslin manufacturer of Saint Quentin; Bacot, cloth manufacturer of Sédan; Beauvais, Depouilly, and Mallec, silk manufacturers of Lyons; M. Laumier, who helped to found steel manufactories in France; Firmin Didot, the eminent printer; Utzschneider, of the Sarreguemines potteries. On this occasion the title of Baron was given to MM. Ternaux and Oberkauf, the decoration of St. Michael to M. Darcet, 360 medals and 17 crosses of the Legion of Honour were distributed among the 1662 competitors who appeared at the exhibition. Altogether, the jury found that no less than 809 of the exhibitors deserved honourable mention.

Four years elapsed after the close of the fifth exhibition before the manufacturers were again summoned to Paris. In 1823, the national exhibition, though deficient in very remarkable productions, and showing a decrease in the number of exhibitors from that of 1819, gave evidence of still further national progress in the application of metals to the purposes of manufacture and to the requirements of engineering. The most noticeable item in the galleries, but which the jury treated coldly as impracticable, was, according to Mr. Digby Wyatt, a model of the first French suspension-bridge, designed by MM. Séguin Frères, to be thrown across the Rhone, near Tournon. This model obtained only a silver medal.

It is remarkable evidence of the increasing popularity of these exhibitions, that the authorities found it necessary to extend the time at each successive exhibition. Thus, while the first exhibition remained open only three days, the sixth was accessible to the public for fifty days. On this occasion, notwithstanding a falling off in the number of exhibitors, the jury decided to distribute no less than 1091 rewards among the competitors.

The report of the jury of this exhibition includes notices of many improvements in native textile manufactures, in the processes of metal manufacture, in dyes, in optical instruments, and in papers.

Another interval of four years elapsed between the closing of the sixth and the opening of the seventh national exhibition. The exhibition of 1827 was in every respect a great advance upon all preceding exhibitions. The building in the quadrangle of the Louvre was on a larger scale than before, and the number of exhibitors amounted to 1795. The progress of national manufactures, and the effect of the use of steam power upon production, were here remarkably shown. The manufacture of merino goods, which in the beginning of the century was unknown in France, now represented an annual value of 15,000,000 francs; and shawl manufactures gave proof of a progress equally sudden and extensive. The improvement and extension of merino manufactures may be traced back to the notable exertions of Chaptal and others to improve the native fleece by inter-breeding with the Spanish flocks which were noticed in the exhibition of the year IX. of the Republic. In the silk trade great advances had also been made. The cultivation of silk, which had been restricted to the southern departments, in the belief that the mulberry would not flourish in the northern departments, was now extended to those colder lands, and found to produce silk of a purer and finer quality than that hitherto raised in the south: floss silk was introduced into many new kinds of material, and mixtures of silk and wool first appeared at this exhibition. In printed cotton, ginghams, tulle, and blonde, splendid specimens were displayed, the cheapness of which was as remarkable as their excellence.. The results of the application of machinery to every department of manufacture were shown in every article exhibited. Paper-hangings, which French manufacturers could now, with the aid of machinery, produce in endless lengths, and which for artistic excellence surpassed those of England, now first enabled France to compete with us successfully in this respect. Bregue exhibited cheap chronometers (priced as low as 40*l.* each). Vicat came forward with some improved and new cements; and from Sèvres some fine specimens of stained glass marked the restoration of this beautiful manufacture.

The seven years which intervened between the seventh and eighth official exhibitions were marked by those commercial disasters which invariably follow political and social discord: however, when, early in 1834, the Government appealed to the manufacturers of France to submit specimens of their products once more to a national jury, no less than 2447 exhibitors responded to the official overture.

Four great galleries were erected upon the Place de la Concorde, and the exhibition was opened with great solemnity. The result was worthy of the importance given to the exhibition. In the report will be found a luminous history and analysis of the progress of French manufactures from 1789 to 1834. It shows, as illustrative of the increased study of machinery, that whereas, in 1798, only ten patents were taken out, in 1834 no less than 576 were issued. The introduction of cylindrical blocks to paper-printing earned a gold medal at this exhibition for MM. Zuler, of Mulhausen, and increased this manufacture beyond the hopes of the most sanguine. Shawls had fallen between 30 and 40 per cent. in value since the close of the exhibition of 1827; the silk trade had increased with rapid strides; flax-spinning was becoming a popular branch of industry; and cotton manufactures, after a protracted and calamitous depression, were reviving apace. While Normandy produced printed cottons of a comparatively coarse and common description for the use of the great industrial classes, Alsace sent forth specimens of printing, which for their brilliant dyes, superiority of design, delicacy of shades, and beauty of manufacture commanded for a long time the London market.. Alsace alone at this time produced annually no less than 720,000 pieces of printed cottons, valued at 24,000,000 francs. The jury of 1834 commended highly the excellence of this brilliant manufacture.

A new manufacture was introduced to public notice at the exhibition of 1834, which has since become of considerable importance, viz. elastic threads manufactured from India-rubber, by MM. Rattier and Guibal, who were rewarded with a gold medal. For the production of some exquisite specimens of marqueterie and ornamental cabinet and inlaid work, this exhibition was remarkable, as well as for some specimens which indicated the revival of the art of wood-engraving, and works which promised to rival the productions of the middle ages, in enamel and "niello," sent in by MM. Wagner and Mansion. The arts were indebted to M. Guymet, of Lyons, for the fabrication of an artificial ultramarine (now well known to

artists as French ultramarine), which was first publicly presented in the ibition galleries of 1834; and the potteries of France exhibited specimens a new combination of clays, which was called opaque china, and which s recommended for its superiority to earthenware and for its comparative eapness. These brilliant achievements of French industry were warded by the distribution of 697 medals and 23 decorations of the gion of Honour.

On the 1st of May, 1839, the ninth official exhibition of industry was ened to the French people. The increased demand for space had essitated the construction of an immense building upon the Carré de rigny of the Champs Elysées. No less than 4381 exhibitors contributed the great national bazaar. A superficial space of 16,500 square metres s covered in to receive specimens of the goods of French manufacturers clusively; and, in addition to this vast space, it was found necessary to nstruct a separate building to receive the splendid products of Mulhausen. e exhibition showed the manufactures of France as far in advance of ir condition of 1834, as in that year they had advanced from their te of 1827. The export trade of the country had increased in an raordinary degree; and the peculiarity of the exhibition of 1839 was cheapness at which all the manufacturers endeavoured to produce. e importance attached to the cheapness of production at this period is own in the classification adopted by the jury. Thus, the first section nprised inventions and improvements, ranged with reference to the portance of their results in manufactures; the second comprehended importance of the factories, and their situation; the third, the actual l commercial value of the products; the fourth, the cheapness realised increased means of production. Here may be discovered a glimpse of e result for which the supporters of these institutions had all along boured. The rewards and honours bestowed upon Jacquard, Aubert, rnaux, and Oberkauf; the learned dissertations of Chaptal and Costoy; e public drawing academies; the general knowledge attained by every enchman of the manufacturing capacities of every district of his country, re beginning to return their promised measure of fruit. The artisans of ance were fast becoming artists; the manufacturers, scientific men; the nufacturers of sabres, builders of steam-engines. The framers of the port proudly described the growing greatness of manufacturing France. ey found that their manufacturers had completely established the nning of wool by machinery, and were making great efforts for the ltivation and manufacture of flax. They saw that the extension and provement of machinery were the foundation of their successes. The lindrical block paper machines, exhibited as a novelty at the exhibition 1834, were now exported from France to all the manufacturing states of rope; Jacquard's machine had been multiplied and improved; M. Grimpé d invented an ingenious mechanism for wood-carving; well-boring struments had been materially improved: France, that in the beginning the century possessed only about a dozen steam-engines, now employed ty foundries in the construction of these machines; warranted chronoeters were now valued at half the price they fetched in 1834; needles the manufacture of which England had hitherto enjoyed a complete onopoly.) were at this time bidding fair to rival those of Birmingham.

Two new materials were also offered to the commercial world at this hibition—stearine and Prussian blue dye. In glass and porcelain manucture, improvement had been no less rapid than in the manufacture of xtile fabrics; and the art of preparing leather had advanced so far, with e aid of enlightened chemists, that France, which, in 1830, imported nned leathers from England, had reversed this order of things, and now ported her prepared hides to the British markets. Fine lithographic ones, which had recently been discovered in one or two departments, gured at this remarkable exhibition; and the marble quarries of the yrenees contributed some splendid specimens of this beautiful material. emer declares, in his work on native exhibitions, that the most hopeful aracter of the exhibition of 1839 was the cheapness of all the manufacures—the diminution in the cost of preparing raw materials for the use of an. "Spun and woven goods, tools, furniture, begin to find their way into e houses of the humble—thanks to the genius which directs industry."

Passing over another five years, we arrive at the year 1844, and the traordinary exertions now necessary to marshal the national manufactures to one building attest the remarkable progress which the country has ade. It is the last official exposition at which Louis Philippe will preside; d before another national exhibition takes place, the Tuileries will be cked, the portrait of the King (that King who now receives the report of e Baron Thénard) will be turned to the wall; and from Claremont an xiled family, now loaded with honours and the envy of Europe, will learn l that concerns the exhibition of 1849.

The official Exhibition of 1844 was the most splendid museum of a tion's industry ever gathered together. In every department there were gns of vigorous improvement. Those engines which visitors to the early xhibitions laughed to scorn, now choke up the greater part of the space f the Carré Marigny; and to their gigantic power the merchants point in xplanation of the splendour and cheapness of their goods. Entering the uilding by the Royal entrance, long galleries are seen stretching right and eft. Turning to the left, the visitor at once discovered the secret of the uccesses of Parisian manufactures. In rows and piles he sees specimens f Parisian cabinet-work of exquisite design, billiard-tables, pianos, inlaid ork, clocks, stamped copper, bronzes, lamps, jewellery, terra-cotta, glass, ooks, paper, musical instruments, all commanding foreign markets more y beauty of design than by great superiority of material. On the opposite side of the building the splendid manufactures of Lyons, L[illegible], Avignon, Metz, St. Quentin, Roubaix, Tourcoing, Rheims, Alençon, Mulhouse, and the Seine Inférieure, are ranged. This splendid bazaar, designed by M. Moreau, and raised within the space of 70 days, certainly contained such a collection as no other country on the face of the earth could have gathered together. The number of exhibitors was 3960, and the varied nature of the exhibition rendered it necessary to appoint no less than 58 jury men. The report which these gentlemen published is a fine specimen of art in itself. It is beautifully and profusely illustrated, and more than any other French report on the same subject, enables the reader to form an opinion on the merits of the particular exhibition with which it deals.

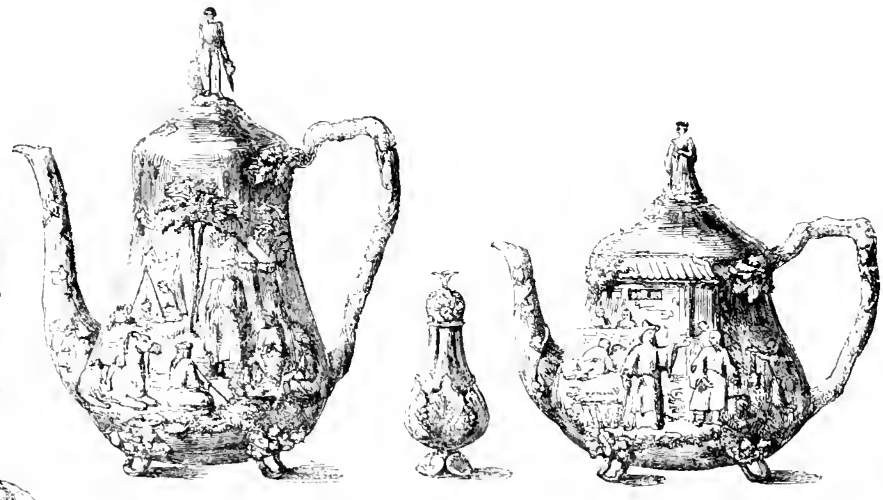
In the vast central apartment, devoted to machinery, some curious machines were exhibited. A machine first exhibited on this occasion was one by means of which a telescope could be easily directed to any quarter of the heavens. This machine was called "The Comet Seeker."

The apparatus for the distillation of salt water, which was hailed as affording security to the mariner against the evil of a lack of fresh water, was eagerly examined; and the specimens of electro metallurgy were then novelties. Artificial manures were also in the list of curiosities. The manufacture of plate glass had been improved for astronomical investigations, and that of sulphate of soda, of sulphate and muriate of potash, of dyes and pigments, of pyroligneous acid, and other chemical combinations, had been studied and perfected. Here stood a machine, by means of which the earth could be bored to the depth of 500 metres. There were endless improvements in all kinds of agricultural implements. Side by side machines worked by steam: the one raising a hammer weighing 9000 kilogrammes; the other a loom, which weaves two shawls at once, and then cuts them asunder with the nicest precision; the third, a floating whistle, to warn the engineer that the boiler wants replenishing with water; the fourth, a machine for stamping coinage; the fifth, a steam apparatus for the manufacture of boilers; and then machines, moved by the great modern power, for piercing, sawing, raising, impelling, in short, for supplying, in endless ramifications, the insufficient human muscle. All these engines for converting raw material into manufactures for human use, told their own bright story in the vast galleries with which they were surrounded.

Of the 3960 exhibitors on this occasion, about 3250, including those of whom honourable mention was made, and whose former rewards were recalled, received marks of distinction. No less than 31 manufacturers received the decoration of the Legion of Honour; and the jury wisely adhered to the rule of rewarding those zealous citizens whose services to national industry were not susceptible of definite exhibition.

The last exhibition of national industry took place in 1849—the year after the dethronement of Louis Philippe. The Carré de Marigny was again the site for the building, and M. Moreau was again the architect selected. The plot of ground covered on this occasion (exclusive of the vast agricultural shed) was a parallelogram of 206 mètres by 100. This building was, as may be seen from a comparison of the plans, more complicated and less imposing than that of 1844. In the centre there was a quadrangle, open to the sky, where, on a mound of turf, surmounted by an elegant fountain, flowers were exhibited. The entire building was of wood, and consisted of about 45,000 pieces of timber, and was roofed with nearly 4000 tons of zinc. Mr. Digby Wyatt found fault with the extra decoration of the building, the pilasters being papered and grained to imitate oak; and *carton-pierre* trusses, painted bronze bas-reliefs, and other "shams" being plentifully scattered about. According to M. Audiganne, this vast building cost 16,000*l.*, being an advance of 950*l.* upon the cost of the building of 1844, or 1*s.* 2⅝*d.* per square foot English. Although the number of exhibitors amounted to 4494, and that of the jury to 64, it is indisputable that the exhibitors of 1849 told a lamentable tale of the industrial paralysis which followed the convulsions of the spring of 1848. Those great manufacturing districts which were distinct features of previous exhibitions, on this occasion presented only a few specimens of their power: even Mulhausen made an insignificant figure. In the application of art to manufacture, however, the exhibition still significantly attested the pre-eminent taste of the French people. Bronzes, clocks, *papier mâché*, and other objects of Parisian industry, pointed to the excellent national economy of gratuitous elementary drawing schools. The President of the French Republic might have referred with proper pride to the development of that system which his great uncle originated. He might have seen the hand of the Emperor in those faultless proportions—those daring originalities—those evidences of artistic culture in which the workmen show themselves to be superior to the artisans of every other country. The artistic excellences of Frenchmen alone redeemed their exhibition of 1849 from insignificance. The progress of silk cultivation was still evident, and promises of future wealth dawned in the specimens of Algerian produce grouped in one of the galleries; but, compared with the brilliant exhibition of 1844, that of 1849 was a failure. The sword had hardly fallen from the warrior-workman's hand; too many looms had been turned to barricades; the excitement to social disorder had barely been quelled, when the Ministry summoned the people from their clubs to the great national bazaar. On this occasion an agricultural show was added to that of manufactures, and the result of the experiment was successful in every particular.

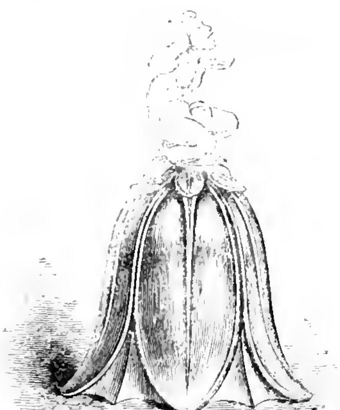
The French exhibition of 1854 will, no doubt, be on a grander and more liberal scale than any of its predecessors; and the example of England will, no doubt, lead the authorities of Paris to a different conclusion from that to which they came on this occasion, viz., not to admit the contributions of foreigners.



TEA AND COFFEE SERVICE.—SMILEY.

SILVER WINE FLAGON.—LAMBERT AND RAWLINGS.

SILVER WINE FLAGON.—LAMBERT AND RAWLINGS.



THE FAERY BELL.

SILVER CLARET JUG.—LIAS AND SONS.

THISTLE INKSTAND.

ORNAMENTAL SILVER.

Our present page contains a group of various small articles in silver, exhibited by sundry manufacturers; all of considerable merit in their way, and calculated to sustain the reputation of the country in this branch of decorative art. We speak generally of the execution; in the choice of subjects we do not in all cases approve, as will be seen.

The Silver Wine Flagons, by Lambert an Rawlings, are noble in form, being after the fashion the old camp-bottle, and decorated in the *rénaissan* style, in silver parcel gilt. Just the sort of thing grace the table of an old baronial hall, on a birthda or other family anniversary.

The design of the Silver Inkstand, by Marti and Co., represented as a Thistle, does not strik us as a very happy idea, whilst the introduction hooks or rests for the pen upon the stalk is decidedl an addition not found in nature; the execution, how ever, is highly satisfactory.

The Silver Tea and Coffee Service, by Smiley, are very beautiful and elaborate works; the designs, which are all punched and richly chased, representing the various stages in the culture and preparation of the tea-plant. We hardly approve, however, of the taste shown in the introduction of the figures of her Majesty and Prince Albert as ornaments or handles to the lids.

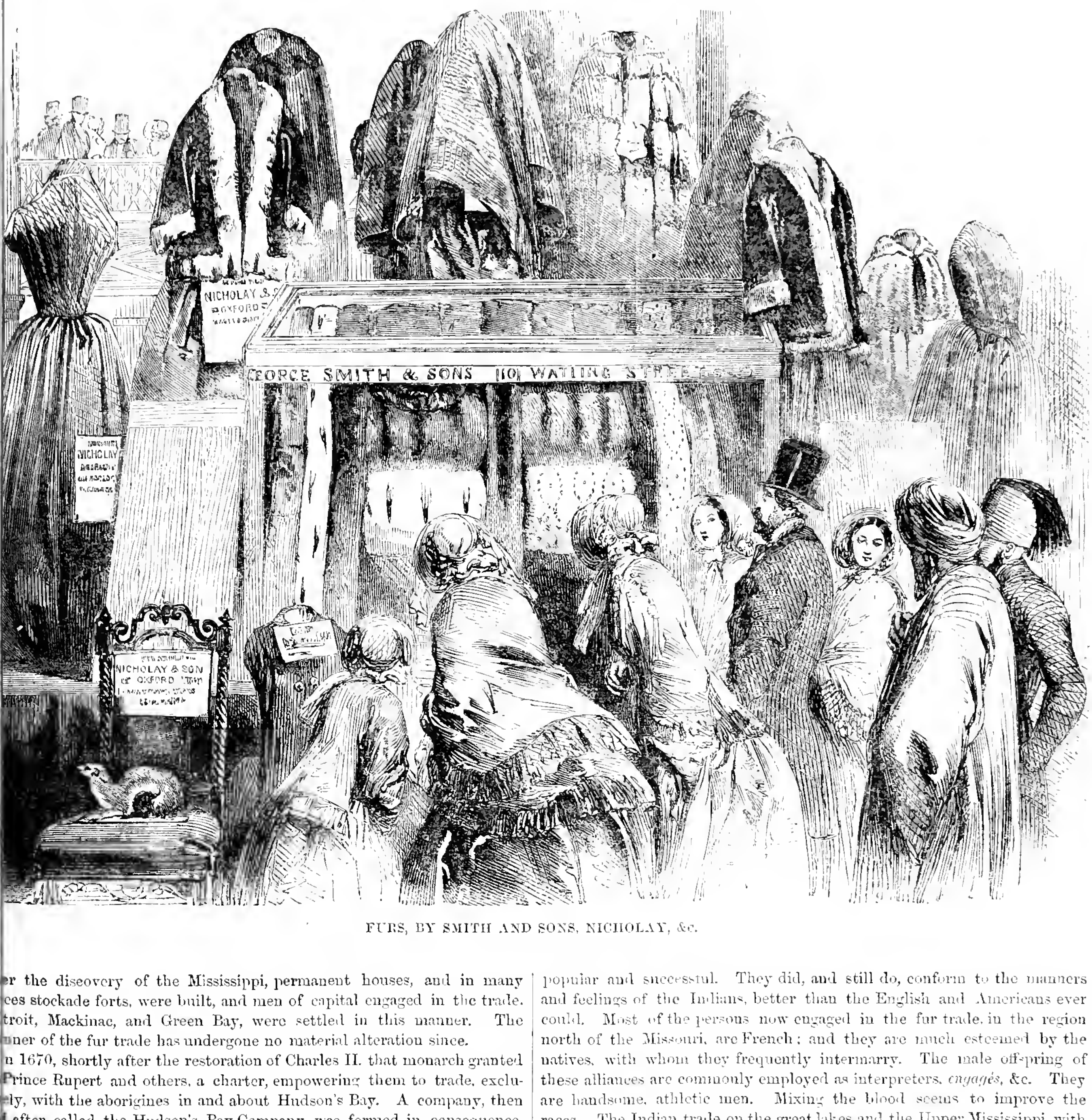
The Silver Claret jug, by Lias and Sons, is very handsomely shaped ewer fashion; somewhat classic in form, covered with vine-leaves, grapes &c. Designed by J. Fitzcook.

The Faery Summoner is a fanciful and pretty idea, very pleasingl realised; Puck shouts lustily, calling the spirits of the air to do hi mistress's bidding.

SKINS, FURS, AND FEATHERS.

WITH SOME ACCOUNT OF THE FUR TRADE.

HE fur trade between Europe and America commenced early in the seventeenth century, and was carried on by the early French emigrants. ebec and Montreal were at first trading posts. The trade was then, as v, a barter of guns, cloth, ammunition, &c., for the beaver and other s collected by the natives, and was effected by the intervention of the *ageurs, engagés,* or *coureurs des bois.* These men carried burdens of rchandise on their backs to the Indian camps, and exchanged their res for peltries, with which they returned in the same manner. Shortly



FURS, BY SMITH AND SONS, NICHOLAY, &c.

er the discovery of the Mississippi, permanent houses, and in many ces stockade forts, were built, and men of capital engaged in the trade. troit, Mackinac, and Green Bay, were settled in this manner. The nner of the fur trade has undergone no material alteration since.

n 1670, shortly after the restoration of Charles II. that monarch granted Prince Rupert and others, a charter, empowering them to trade, exclu- ly, with the aborigines in and about Hudson's Bay. A company, then after called the Hudson's Bay Company, was formed in consequence. e trade was then more lucrative than at present. In the winter of 1783 , another company was formed at Montreal, called the North-west Fur mpany, which disputed the right of the Hudson's Bay, and actively osed it. The Earl of Selkirk was at that time at the head of the dson's Bay and conceived the plan of planting a colony on the Red er of Lake Winnepeg. Of this colony, the North-west Company was suspicious. In consequence of this, and the evil feelings naturally growing out of a contrariety of interest, a war ensued between the servants of the parties, and a loose was given to outrage and barbarity. Wearied, at last, in 1821 the companies united, and are now known by the name of the Hudson's Bay Fur Company. The colony established by Lord Selkirk soon broke up, the settlers going to the United States. Few are aware of the extent of the territory of the Hudson's Bay Company. It covers one-eighth of the habitable globe. Russia comes next in order of importance in this respect, but the race of animals are different.

Of all who have traded with the aborigines, the French were the most popular and successful. They did, and still do, conform to the manners and feelings of the Indians, better than the English and Americans ever could. Most of the persons now engaged in the fur trade, in the region north of the Missouri, are French; and they are much esteemed by the natives, with whom they frequently intermarry. The male off-spring of these alliances are commonly employed as interpreters, *engagés,* &c. They are handsome, athletic men. Mixing the blood seems to improve the races. The Indian trade on the great lakes and the Upper Mississippi, with its branches, has long been in possession of the North American Fur Company, the principal directors of which are in the city of New York.

In the year 1822, a new company, entitled the Columbian Fur Company, was organised, to trade on the St. Peter's and Mississippi. It was projected by three individuals, who had been thrown out of employment by the union of the Hudson's Bay and North-west, as before mentioned. Its

operations soon extended to the Missouri, whither its members went from the sources of the St. Peter's, with carts and waggons, drawn by dogs. When it had, after three years' opposition, obtained a secure footing in the country, it joined with the North American. There was another company on the Missouri at the same time.

Furs were also obtained from the Upper Missouri and the Rocky Mountains as follows: Large bodies of men (under the pretence of trading with Indians, to avoid the provisions of the law,) were sent from St. Louis, provided with traps, guns, and all things necessary to hunters and trappers. They travelled in bodies of from 50 to 200, by way of security against the attacks of the savages, till they arrived at the place of their destination, when they separated, and pursued the fur-clad animals singly, or in small parties. When their object was effected, they assembled with their peltry, and descended the Missouri. They did not always invade the privileges of the natives with impunity, but sometimes suffered severely in life and property. This system still continues, and its operatives form a distinct class in the state of Missouri. The articles used in the Indian trade are chiefly these: coarse blue and red cloth and fine scarlet, guns, knives, blankets, traps, coarse cottons, powder and ball, hoes, hatchets, beads, vermilion, ribbons, kettles &c.

The course of a trader in the North-west is this: He starts from Michilimackinac, or St Louis, late in the summer, with a Mackinac boat, laden with goods. He takes with him an interpreter, commonly a half breed, and four or five *engagés*. On his arrival at his wintering ground, his men build a store for the goods, an apartment for him, and another for themselves. These buildings are of rough logs, plastered with mud, and roofed with ash or linden slabs. The chimneys are of clay. Though rude in appearance, there is much comfort in them. This done, the trader gives a great portion of his merchandise to the Indians on credit. It is expected that the debtor will pay in the following spring, though, as many neglect this part of the business, the trader is compelled to rate his goods very high. Thus the honest pay for the dishonest. Ardent spirits were never much used among the remote tribes. It is only on the frontier, in the immediate vicinity of the white settlers, that the Indians get enough to do them physical injury, though, in the interior, the traders, in the heat of opposition, employ strong liquors to induce the savages to commit outrage, or to defraud their creditors. By this means, the moral principle of the aborigines is overcome, and often destroyed. Spirit is commonly introduced into their country in the form of high wines, they being less bulky, and easier of transportation, than liquors of lower proof. Indians, after having once tasted, become extravagantly fond of them, and will make any sacrifice, or commit any crime, to obtain them.

Those Indians who have substituted articles of European manufacture, for their primitive arms and vestments, are wholly dependent on the whites for the means of life, and an embargo on the trade is the greatest evil that can befal them. It is not going too far to say that the fur trade demoralises all engaged in it. The way in which it operates on the Indians has been already partially explained. As to the traders, they are, generally, ignorant men, in whose breasts interest overcomes religion and morals. As they are beyond the reach of the law (at least, in the remote regions), they disregard it, and often commit or instigate actions that they would blush to avow in civilised society. In consequence of the fur trade, the buffalo has receded hundreds of miles beyond his former haunts. Formerly, an Indian killed a buffalo, made garments of the skin, and fed on the flesh while it lasted. Now, he finds that a blanket is lighter and more convenient than the buffalo robe, and kills two or three animals, with whose skins he may purchase it. To procure a gun, he must kill ten. The same causes operate to destroy the other animals. Some few tribes, the Ottaways for example, hunt on the different parts of their domains alternately, and so preserve the game. But by far the greater part of the aborigines have no such regulation.

The fur-clad animals are now to be found in abundance only in the far north, where the rigour of the climate and the difficulty of transportation prevent the free access of the traders, and on the Upper Missouri, and towards the Rocky Mountains. Those unacquainted with the mercantile relations connected with this article of commerce will doubtless feel surprised at their magnitude, as shown by the following table of imports and exports, which has been compiled with great care from various sources:—

IMPORTS AND EXPORTS FOR 1850.

	Total importation into England.	Exported.	Consumed in England.
Raccoon	525,000	525,000	None.
Beaver	60,000	12,000	48,000
Chinchilla	85,000	30,000	55,000
Bear	9,500	8,000	1,500
Fisher	11,000	11,000	None.
Fox, Red	50,000	50,000	None.
" Cross	4,500	4,500	None.
" Silver and Black	1,000	1,000	None.
" White	1,500	500	1,000
" Grey	20,000	18,000	2,000
" Kitts	55,000	50,000	5,000
Martin or Sable	120,000	15,000	105,000
Mink	245,000	75,000	170,000
Musquash	1,000,000	150,000	850,000
Otter	17,500	17,500	None.
[illegible]	15,000	[illegible]	2,500
[illegible]	[illegible]	[illegible]	None.

EUROPEAN FURS FOR 1850.

	Imported.	Exported.	Consumed in England.
Martin, Stone, and Baum	120,000	5,000	115,000
Squirrel	2,271,258	77,160	2,194,098
Fitch	65,091	28,276	36,815
Kolinski	53,410	200	53,210
Ermine	187,104	None.	187,104

The first proposal as to the exhibition of furs was, that it should be joint affair amongst the merchants, wholesale dealers, and retailers—a shap in which (although four of the leading houses in the trade contributed the great case in the centre of the Western Nave, which goes by the nam of the Fur Trophy) the project did not get carried out; the wholesa dealers at first hanging back, under the impression, that, though firs migh be shown of every class, and in every stage of finish, they scarce sufficient formed an article of manufacture for exhibition: finally, however, near all dropped in, it being felt that a branch of trade occupying so large amount of capital and employing such a number of hands should be fair represented; and, therefore, in the wholesale trade, Messrs. George Smit and Sons, of Watling street; Robert Clark and Sons, Cheapside; Bevingto and Morris, King William-street; Lutze and Co., King Edward-stree Myer and Co., Bow-lane; and George Ellis, Fore-street; and in the reta Nicholay and Son, Oxford-street; R. Drake, Piccadilly; Ince and So Oxford-street, became exhibitors either in the common case or in spaces their own.

The skins and furs from the Arctic regions, sent by the Hudson's B Company, selected from their importation of 1851, and prepared a arranged by Messrs. J. A. Nicholay and Son, her Majesty's furriers, were great value, beauty, and interest. The groups of the varieties of fox included the black, silver, cross, red, blue, white, and kitt. The black a silver fox is the most valuable of this tribe—a single skin bringing fro ten to forty guineas; they are generally purchased for the Russian a Chinese markets, being highly prized in those countries. The cross a red fox are used by the Chinese, Greeks, Persians, &c., for cloak linings a for trimming their dresses. The white and blue fox are used in this a other countries for ladies' wear. In the sumptuary laws passed in the rei of Henry III., the fox is named, with other furs, as being then in use. has been stated that the fox in the Arctic regions changes the colour of fur with the change of the seasons. Such, however, is, we believe, not t case, with the exception of the white fox, which is in winter a pure whi and in summer of a greyish tint. Among other groups shown we beautiful specimens of the otter (*Lutra Canadensis*). The Hudson's B North American, and European otters are chiefly exported for t use of the Russians, Chinese, and Greeks, for caps, collars, trimmin robes, &c. It may not be uninteresting to state, that upwards of otters, the produce of this country alone, were exported during the year.

Near to these was a beautiful and interesting group of beavers (*Cas Americanus*). The beaver, in former years, was one of the Hudson's F Company's most valuable productions; but since its use has been alm entirely discontinued in the manufacture of hats, it has lost much of value. Experiments have, however, been made, and are progressing sat factorily, to adapt its fine and silky wool to weaving purposes. For ladi wear, a most beautiful fur has been the result of preparing the beaver by new process, after which the surface is cut by an ingenious and cost machine. It is exported in its prepared state for the use of the high classes in Europe and the East. The rich white wool from the under p of the beaver brings at the present time a very high price, and is, we beli largely exported to France, where it is manufactured into a beautiful descr tion of bonnets.

Passing from the beavers, we came to two groups, one of the lynx (*Fe Canadensis*), the other of the lynx cat (*Felis rufa*); both of which, wh dyed, were formerly much used. Their rich, silky, and glossy appearan justly caused them to be great favourites; but the caprice of fashion length banished them from this country. They are, however, still dy prepared, and exported in large numbers for the American market, whe they are much admired. In its natural state the fur is a greyish whi with dark spots, and it is much used by the Chinese, Greeks, Persians, a others, for cloaks, linings, &c., for which purposes it is very appropria being exceedingly warm, soft, and light. The lynx of the present day the fur formerly called the "lucern."

We had next groups of the Wolf (*Canis occidentalis*); of the Fisher (*Mu tela Canadensis*); of the Wolverin (*Gulo luscus*). The wolves' skins a generally used as cloak and coat linings in Russia and other cold cou tries, by those who cannot afford the more choice kinds; also for slei coverings and open travelling carriages. The other skins enumerat are principally used for trimmings, &c. The tail of the *Canis occidenta* is very valuable, and is exclusively used by the Hebrew race on t Continent.

The North American Badger, of which some fine specimens were show is exported for general wear; its soft fine fur rendering it suitable for th purpose. The European badger, on the contrary, from the wiry nature its hair, is extensively used for the manufacture of the superior kinds shaving brushes.

The Hudson's Bay Martin or Sable (*Mustela martes*), is principally us [illegible] wear, and is next in repute and value to the Russian sable. It

onsumed in large quantities in this country, in France, and in Germany. he darkest colours are the most valuable, and the lighter shades are fre- uently dyed to imitate the darker varieties. The heraldic associations onnected with the sable render it highly interesting to the historian and he antiquary. In every age it has been highly prized. The lining of a antle made of black sables with white spots, and presented by the Bishop f Lincoln to Henry I., was valued at £100, a great sum in those days. In enry VIII.'s reign, a sumptuary law confined the use of the fur of sables o the nobility above the rank of viscounts.

The Mink (*Mustela vison*), is exclusively the produce of the Hudson's ay Company's possessions and other parts of North America. It is onsumed in Europe in immense quantities, principally for ladies' wear; s rich, glossy appearance, and dark brown colour (similar to sable), ombined with its durability and moderate cost, justly render it a great vourite.

The musquash, or large American musk rat, is imported into this country immense numbers; it was formerly used much in the manufacture of ts, but the introduction of the silk hat has entirely superseded it. The usquash is now dressed in a superior way, and is manufactured extensively r female wear, both in its natural and dyed state. It is a cheap, durable, d good-looking fur. This humble article has, we believe, been introduced the public under every name but its real one, and thousands who se it are led to believe that they are possessed of sable, mink, and other al furs.

The beautiful fur known as "swan's-down," of which there were several ecimens, is obtained from the swan after the feathers have been plucked. he feathers, prepared and purified, are used for beds, and being exceed- gly durable and elastic, are particularly suited for that purpose. The udson's Bay swan quills are much in demand for pens, and for tists' brushes or pencils, and command a high price. A portion of the umage is also used for ornamental and fancy purposes, and military umes.

The white hare (*Lepus glacialis*), from the Polish regions, and also from ussia, is perfectly white in winter, but in summer it changes to a greyish it. The skins being exceedingly tender, it has latterly given place to the hite Polish rabbit, which is more durable and therefore more suitable for at purpose. When dyed, it looks exceedingly rich and beautiful, and is ten palmed off upon the inexperienced for superior furs.

The Hudson's Bay rabbit is one of the least valuable skins imported by e company. Like all furs from the polar regions, it is fine, long, and ick, but the skin is so fragile and tender that it is almost useless; it is, owever, dyed and manufactured for ladies' wear, and is sold by many ealers, we believe, under various names, and even frequently as sable; but, the great annoyance of the purchasers, it soon breaks, the fur rubs off, d it falls to pieces.

The large North American black bear is termed the Army Bear, because s fur is generally used in this and other countries for military purposes, r caps, pistol holsters, rugs, carriage hammer-cloths, sleigh coverings, and ecompaniments. The fine black cub bears are much sought after in Russia r making shube linings, coat linings, trimmings and facings; the other rts, with the large grey bears, for sleigh coverings, &c. The skin of the hite Polar bear, the supply of which is very limited, is generally made to rugs, which are often bordered with that of the black and grey bear. he brown Isabella bear is at the present time used for ladies' wear in merica. Forty years since the Isabella bear was the most fashionable fur England—a single skin producing from 30 to 40 guineas; but the caprice f fashion causes similar skins at the present time to produce not more than many shillings.

Near the group of bears was a small and valuable collection of the skins f the Sea Otter (*Entrydra maritima*). This animal is mostly sought after y traders on account of its value—a single skin producing from 30 to 40 uineas. It is said to be the royal fur of China, and is much used by the reat officers of state, mandarins, &c. It is in great esteem in Russia, and principally worn by the nobles, for collars, cuffs, facings, trimmings, &c. n account of its great weight it is rarely used by ladies.

Among North American and Canadian skins, Messrs. Nicholay and Son xhibited likewise a group of raccoon (*Procyon lotor*). The finest qualities f raccoon are, we believe, produced in North America, and are imported to this country in immense numbers. They are purchased here by mer- hants who attend the periodical fur sales, and who dispose of large quan- ties at the great fair at Leipsic. They are principally used in Russia and roughout Germany, for lining shubes and coats, and are exclusively con- ned to gentlemen's wear. The dark skins are the choicest, and are very luable. We have next a group of Cat Lynx (*Felis rufa*). This animal is ostly found in Canada, and is a distinct variety of the lynx species; the ins are exported, and are made into cloak and coat linings, being very itable for cold climates, and very moderate in price.

The North American minx is found in great numbers in Newfoundland, abrador, the Canadas, &c., and is the finest of the species. Several most xcellent specimens of this skin were shown.

Some furs of the Virginian or North American grey fox completed the ollection of the produce of the Canadas, Newfoundland, and Labrador. his fur is at present used to a considerable extent for open carriage wrap- ers, sleigh wrappers, coat and cloak linings, also for fur travelling bags, oot muffs, &c. Its exceedingly moderate price, warmth, and great dura- lity render it an especial favourite.

(*To be continued.*)

THE GREAT EXHIBITION.

(FROM THE "ATHENÆUM," NOV. 15.)

It is to the general public that the producer of every article of utility turns for encouragement and support; and it is therefore in the hands of the great body of purchasers that the fate of art, as the design is adapted to manufactures lies. By their judgment, whether good or bad, the key must be given in harmony with which the artist and the workman must tune their inspirations. Many, we have little doubt, first turned their attention to their responsibities in this matter on the occasion of their repeated visits to the galleries of the Crystal Palace. There, probably for the first time, they entered on the task of selection in a serious spirit. Actual comparison furnished them with an unerring test of excellence; and many a lesson on the combination of utility and beauty was doubtless there intuitively acquired.' The forms of many of the objects displayed were thus imprinted on their imaginations, as standards wherewith to compare others on which their faculties as judicious purchasers might be subsequently exercised. It is not to be expected, however, that the ideas thus formed could be otherwise than crude and imperfect; and it is fortunate that the power of graphic illustration which is now happily so universal amongst us should bring to their aid the materials requisite for fortifying their memories and reviving their original impressions. Who that remembers the costly engravings which illustrate such works as Stuart and Revett's "Athens," and the early publications of the Dilettanti Society and of the Society of Antiquaries—and turns from them to that wonder of the nineteenth century, the "Illustrated London News"—can fail to recognise the remarkable extension of the power of graphic delineation in this country during the last hundred years? Every draughtsman will at once acknowledge the impossibility of depicting rapidly and correctly an unceasing variety of subjects without the constant exercise of a nice power of discrimination between those peculiarities of form which confer either beauty or deformity on each different object. The plethora of sketching, which is the great characteristic of the present age, as compared with the habit of our forefathers, may be considered to amount almost to a mania; but, while it indicates the excitable temperament of a public ever craving after fresh food for imagination, it by no means implies the absence of that balance of judgment which should exist in every well-regulated mind. While the unceasing swarm of modern periodical publications accumulates from week to week, and almost from day to day, abundant material for the study of the artist, it ministers largely to the amusement of the public; and not to their amusement only—since it provides for those who are willing to use them lessons of no slight importance. How many are there whose impressions of picturesque form are derived almost exclusively from these sources—the Protean variety of which serves to demonstrate, that, when treated by the artist's mind and touched by his skill, almost every diversity of style may be alike invested with the aspect of grace and of beauty.

SALTER'S MODEL OF THE GREAT OPENING BRIDGE AT SELBY.

Amongst the interesting models exhibited, that by Salter of the Great Opening Bridge at Selby, on the line of the Hull and Selby Railway, is particularly worthy of notice, the work represented being of so novel a character, on account of its large span.

The river Ouse is at all times rapid, and particularly so during the times of the frequent freshes or floods; it required, therefore, that a bridge of peculiar construction should be resorted to, in order to meet the require- ments of the peculiar case. By the Act of Parliament for the Hull and Selby Railway, which obtained the sanction of the Legislature in 1836, it was stipulated that the bridge at Selby should have an opening arch of 44 feet span for the sea-borne vessels trading to York. Messrs. Walker and Burges, who have erected so many of the cast-iron bridges which are dotted about in different parts of the kingdom, were engineers for the railway: the bridge, therefore, was executed under their direction; the contract for the iron work being undertaken by the Butterly Iron Company, and carried out with the usual spirit displayed by that firm. The river at the point of crossing is about 200 feet in width, and at low water 14 feet in depth, the tide rising 9 feet at springs and 4 feet at neaps. The bed of the river consists of silt resting on a thin bed of sand, beneath which is clay of a hard quality. The bridge was commenced in the autumn of 1837, and finished in the spring of 1840. The land abutments are constructed of brickwork and masonry resting on piles; those under the west abutment being 18 feet, and those under the opposite abutment 28 feet long respec- tively. The intermediate piers for the support of the superstructure are formed of open pile-work, the piles being driven 15 feet into the solid clay, and their tops surmounted with cap sills of large scantling, upon which the iron-work is bedded.

To give additional stiffness to the two centre piers, a plan was resorted to in the bracing, which, although novel in itself, was executed with very little difficulty, and is found, after years of experience, fully to answer the purpose. This was effected by rounding the centre piles for a portion of their length, so as to allow the cast-iron sockets to descend and take a solid bearing on the square shoulders of the piles, to which were connected the long timber braces; so that when the sockets, with the braces attached, were let down to their bearings, the tops of these braces were brought to their places at once, and secured to the cap sills.

TABLE AND BOOKCASE.

BY G. J. MORANT.

The table is of elegant design, and distinguished by the finest workmanship. It was made for the Duchess of Sutherland, and, we believe, from her design. The swans are painted white, the lilies and bulrushes partly gilt and partly white. The bookcase is also white and gold, and of very pretty design.

A Self-acting Fire Alarum and Railway Whistle.—This is an invention by Mr. D. Lloyd Price, a watchmaker of Breconshire, the novelty of which consists of an extremely delicate and sensitive expanding compound metallic segment, which may be adjusted to suit any temperature by means of a small screw. The exhibitor having deposited two of the instruments in the Exhibition, one has been since removed, by permission of the Commissioners, to Somerset House, where it was tested by being placed in a room containing about 2000 cubic feet of air. The machine being adjusted a few degrees above the temperature in the room, a sheet of paper was ignited, and was found sufficient to raise the temperature so as to set the alarum in motion. The mechanism of the instrument consists simply of a pulley and weight, and a small lever, which is detached by a helix—the whole being enclosed in a small case about 15 by 18 inches, including the small permanent voltaic battery; and when once fixed, the inventor states that it would not require to be touched for years, and would always remain like a sentinel ready charged, giving instantaneous notice of the approach of the enemy. One of these instruments is sufficient for a whole building, containing any number of rooms, and it may be fixed in any convenient position for alarming the inmates or police in the event of an unusual increase of temperature in any part of the edifice. It is also applicable to the holds of vessels, where, in long voyages, spontaneous combustion and other accidents by fire are likely to occur. The same principle of construction is applied to the steam-whistle invented by the exhibitor, and which may be adapted to steam vessels or locomotive railway carriages.

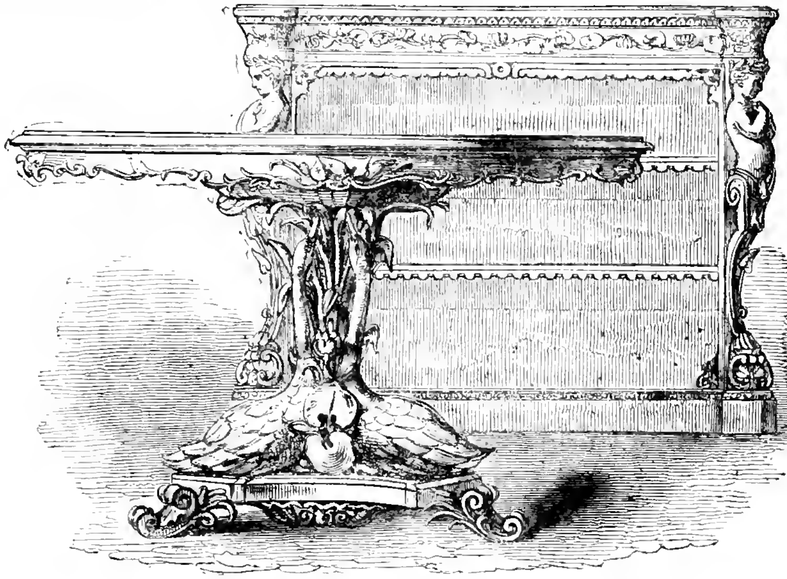


TABLE AND BOOKCASE.—G. J. MORANT.

CABINET.—TAHAN.

CABINET.—BY TAHAN.

A piece of boudoi furniture, upon which al that good taste could suggest and art accomplish, has been lavished with an unsparing hand. It is of pear-tree wood, elaborately carved, with devices in foliage with birds. In the panels are very successful copies on porcelain of Madame Marcelle's celebrated studies after Goethe's "Mignon," the originals of which formerly belonged to the Duke of Orleans, but are now in the possession of M. Molé.

Irish Chemical Produce—Ramelton, County of Donegal.—We observed in the Great Exhibition a case of chemical stuffs, produced from Irish sea-weed, viz., iodine chloride of potasian sulphate of potash, and alkaline or kelp salt, manufactured in the Ramelton Chemical Works, by the exhibitor, Mr. John Ward. These works, the first of the kind started in Ireland, were established by Mr. Ward, in March 1845, in Ramelton—a small town on an arm of Lough Swilly, county Donegal, within about fifteen miles of Derry. Previous to their establishment the people of the north-west coast of Ireland had comparatively no home-market for the produce of their industry in so far as regarded the manufacture of kelp from sea-weed, consequently but little was produced but since the opening of the works in Ramelton, a large annual consumption of kelp at the works, has caused it to be made in much greater abundance and the prices raised to a considerable extent, creating, thereby, not only a large circulation of money in that part of the country, but conferring great benefits on the neighbouring coasts, by the extensive employment it affords to the poorer classes in the neighbouring districts. A very considerable shipping trade has also sprung up in vessels varying from 50 to 120 tons, which the importation of raw materials, and the exportation of manufactured stuffs, have been the means of bringing to Lough Swilly. We understand that the iodine and other chemical produce of these works already bear a good reputation in the London and continental markets.

The
CRYSTAL PALACE
AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

SCULPTURE.

THESEUS AND THE AMAZONS,
BY T. ENGEL.

THIS group, which is the property of Prince Albert, occupied a good position in the South Transept, facing the crystal fountain. The artist is a Hungarian by birth, but has studied many years in this country, and also at Rome, at which latter place this group was executed.

The situation intended to be presented is an incident supposed to have occurred in the course of the war of the Athenians under Theseus against the Amazons; when one of the female warriers being badly wounded, a sister in arms rushes to her rescue; and, having seized her in her arms, is about to deal vengeance on the foe, when on a sudden a sentiment of pity touching the breast of the wounded Amazon, as she views his prostrate position, she restrains the arm which was to have dealt his death-blow. The group, which is executed in marble, is prettily conceived, and carried out with graceful rather than powerful effect. There is in fact a certain degree of tameness about it leading to disappointment, which may be accounted for by the fact that the artist has not sought to embody the Amazonian *physique* in his female subjects. M. Engel's heroine wants a little of the masculine energy of the Amazon of Kiss. With this reservation, we must add that the figures in this group are executed with great artistic feeling; the character of the heads is dignified and expressive. The draperies are not so successful; they want flow and smoothness.

The actions of this race of heroines whether fabulous or not, were often the subject of the ancient sculptor's chisel. There are various representations of the figures and costume of Amazons among the terra-cottas in the British Museum. The battles of the Athenians and the Amazons are represented on the friezes of the Temples of Theseus at Athens, and of Apollo Epicurus on Mount Cotylion, near the ancient city of Phigaleia, in Arcadia. In the latter sculptures, which are now in the British Museum, the Amazons are all represented with perfect and well-shaped breasts. Indeed, the same is the case in all the other ancient works in which Amazons are introduced: they are invariably sculptured with both breasts entire; but they have generally, like the huntresses attendant on Diana, one exposed and the other concealed by drapery.

THESEUS AND THE AMAZONS.—T. ENGEL.

MINING AND METALLURGY.

EXTRACTION AND PREPARATION OF MINERAL ORES.

THE ores which exist in mineral veins are, to a certain extent, obtained during the cutting of the longitudinal galleries described in our last article on this subject; but as these are situated at considerable distances from each other, the ores thus raised form but a very inconsiderable portion of the contents of the entire lode. To extract, therefore, the whole of the metals contained in the vein, the mineral ore is worked out between the different levels, and the space thus left unoccupied is filled up with unproductive fragments of rock, arising from the other operations of the mine.

On reaching the surface the ores are broken by means of large hammers, and divided into classes, according to their relative richness in metal, whilst the stony and valueless portions are picked out and thrown away. Few ores contain so large an amount of metal as to render their concentration by mechanical means unnecessary, and various contrivances are consequently employed for the removal of these earthy impurities, before subjecting them to metallurgic treatment.

In order to reduce the fragments of mineral ores, and particularly those of copper, to a proper and uniform size for the subsequent mechanical concentration, large cylinders of cast iron, moved in contrary directions, either by water or steam power, are frequently employed. These rollers are so arranged as to admit of being either advanced closer together or separated at a greater distance, according to the nature of the ores to be crushed; and in order to prevent accident from the passage of large pieces of stone too hard to be broken, a certain elasticity is given to the apparatus by causing the cylinder to be constantly forced together by a long lever acting on the bearings in which they work. The other extremity of this lever is loaded with a heavy weight, by which, when a large fragment passes through, the arrangement is slightly lifted, and the apparatus itself protected from rupture. On passing through the rollers the crushed ore falls into the higher extremity of an inclined cylinder of coarse wire gauze: this, being set in motion by the same power as the rollers themselves, divides the mineral into two distinct classes; the one passing through the meshes of the trellis, and falling on the floor—whilst the other, which is too large to pass through the apertures of the sieve, is carried out at the lower end of the hollow cylinder, where it falls into the buckets of an endless chain, by which it is again brought to the level of the mill, where it is recrushed.

Many minerals, and especially the ores of tin, instead of being passed between rollers, as above described, are pounded into small fragments by large pestles, moved either by water or steam power. The machine by which this is effected is called a stamping mill, and the pestles or lifters by which the ore is crushed are set in motion by an axle, with cams spirally arranged around it, so that each lifter may give three blows during one revolution of the axle. The lower part of this machine, where the iron heads of the pestles come in contact with the mineral to be broken, is enclosed in a large wooden trough, in which are several openings fitted with small metallic gratings through which the pounded ore is washed by a current of water, which is constantly passing through the gratings; and the powdered mineral is in this way carried off into large pits, where it subsides in the form of a finely-divided sand.

The mechanical concentration of ores depends in principle on the circumstance that, if bodies of very different specific gravities, and of nearly the same dimensions, are first agitated together in water, and then allowed to subside, they will be found to have arranged themselves at the bottom of the vessel very nearly in accordance with their several densities; and therefore the heavier minerals, when thus treated, are readily separated from the lighter earthy impurities, with which they are constantly associated.

One of the most simple methods of effecting this object is by the use of the hand-sieve, which is made of a sheet of perforated copper fixed in a deep wooden hoop. To use this it is first partially filled with the crushed ore, and then held by the workman in a large tub filled with water, where he gives to it a sort of undulating motion, which causes the richer and heavier portions to accumulate on the bottom, and the earthy grains to rise on the surface. After a short time he withdraws the sieve from the water, and whilst it is resting on the edge of the tub, he scrapes off, by means of a piece of thin iron, the particles thrown on the surface. This is followed by a second washing and scraping, and when the whole of the worthless matter is removed, that which remains at the bottom of the sieve is sufficiently pure to be at once subjected to metallurgic treatment.

Instead of using hand-sieves, machines are now generally employed for this purpose. On the continent the sieve, instead of being moved directly by the hand, is attached to the end of a long balanced lever; and in this country the use of the hand-sieve is almost superseded by the jigging-machine, which consists of a number of copper sieves fixed in the lid of a large cistern, in which the level of the water is alternately raised and lowered in rapid succession by a piston, set in motion by machinery. The water which is thus made to pass through the meshes of the sieves produces on the mineral which they contain the same effect as if the sieves were themselves moved in the water; and therefore, after repeatedly removing the lighter particles which constantly accumulate on the surface, the ore which remains at the bottom of the sieves is sufficiently pure to be ready for immediate metallurgic treatment. Of the portions which are scraped off the sieves, the lightest, which contains little or no metallic ore, is thrown away, as being entirely useless; but the second—which consists of a mixture of gaugue and metalliferous substances, together with the fine dust which passes through the holes of the sieves—is sent to the stamping mills, where it is reduced to the state of a very fine powder, by which means greater facilities are afforded for its separation from the earthy matters with which it is associated.

The water and fine sand escaping through the gratings of this machine are now conducted into a kind of reservoir, where the heavier particles are first deposited, whilst the poorer and consequently lighter parts are removed to a greater distance. By this treatment a certain classification of the stamped ore is effected, as those portions which have been carried by the force of the water beyond a given point are collected in a separate pit from those which have not arrived so far from the stamping mills.

The method of washing and preparing these sands for subsequent metallurgical treatment differs according to the nature of the ores which they contain, and it is also more or less regulated by the state of division in which they occur. In all cases, however, these operations are dependent on precisely the same physical principles; and the prepared ores, when in a finished state, should be so far freed from earthy impurities as to admit of being advantageously fused in properly constructed furnaces, for the purpose of extracting the metal which they contain.

Among the models of machinery relating to this subject exhibited was a jigging-machine, and a buddle for washing gold ores, by Mr. J. Hunt. The jigging-machine consists of a set of sieves, to which a rapid up-and-down motion is given by a camed wheel acting on the ends of levers, to which they are suspended; and it differs only from that in general use, inasmuch as the sieves are in most instances moved by either a crank or excentric, which, although subject to very much less wear and tear than the cam motion, does not give such decided or rapid movement to the particles of ore resting on the meshes.

The buddle, or washing-box, for gold ores, differs from that in common use, in having moveable buttons on the head-board, by which an even thickness of water may be directed over its whole surface. This, in many operations, is of much importance, and in such cases the apparatus will be found advantageous.

The different processes by which the concentration of the metallic ores may be effected, were best exhibited in a model of the Tywarnhaile dressing floors, which included some of the latest and most important improvements which have been introduced into this branch of industry.

There was also a case in this department, containing a series of products obtained by Mr. Longmaid, in the purification, according to his patent process, of the various metallic ores of which sulphur forms a principal ingredient. This process consists in calcining, in a furnace having several successive floors, a mixture of the ore in fine powder with a proper quantity of common salt, by which means, sulphates of soda, and some of the other salifiable bases present, are produced; and those minerals, such as the oxide of tin, which do not afford a strong base, are subsequently obtained as a residue of lixiviation.

The less arsenic contained in the ore the better it will be for this purpose, although its presence is not an insurmountable objection, especially if associated with a small per-centage of copper. A charge is by this method drawn about every twenty-four hours from the front bed, and each of the three remaining charges will then be moved forward to the next lower bed, and a fresh charge put into the upper one—each of the charges being kept regularly raked in its turn. A brisk fire is to be kept up in the furnace during the whole time, and a damper is applied to the chimney to obtain regulation. As the decomposition of the salt and ore proceeds, the mixture is gradually prepared for the increase of temperature obtained by removal from the upper to the next lower bed, and so on, approaching the fire. The operation appears to proceed best when, on the bed nearest the fire, it has been brought to a semi-pasty condition, or when the mass has a tendency to agglomerate, and seems to be moist on the surface. By the increase of temperature to which it is here exposed, the charge soon begins to dry up, so that it is eventually drawn in a granular condition. The sulphate ash obtained contains sulphate of soda or salt-cake, chloride of sodium, oxides of iron, a soluble salt of copper, and oxide of tin (if any tin was present in the ore employed), provided the ore be iron pyrites; and if other ores are used, other products will be obtained. The ash, being lixiviated with water, affords the oxides of iron and tin. If oxide of tin be contained in the ore employed, it may be separated from the residual matters by washing—the greater specific gravity of the oxide of tin rendering the separation comparatively easy. The copper may be separated from the solution either with iron, as is well understood, or by the addition of lime slacked in water, forming a milk of lime. Iron precipitates the copper in a metallic form, but it is thrown down by lime as an oxide, associated with the excess of that earth employed, and with some small portion of sulphate of lime. The precipitate, having been separated by filtration from the refined liquor, is well washed, in order to effect the complete separation of sulphate of soda, and chloride of sodium—the liquors obtained being employed in the lixiviation of fresh sulphate ash.

This precipitate is bulky, but by filtration and drying its volume is very much diminished, and it is then obtained in a condition fit for reduction to the metallic state by the usual metallurgical process. The solution from which the copper has been separated may, if required, be concentrated by boiling, and set aside to crystallise in suitable vessels, very fine crystals of sulphate of soda being obtainable.

In connection with this subject, the series of specimens illustrative of the process invented by Mr. Robert Oxland, of Plymouth, for dressing ores of tin associated with wolfram, is particularly deserving of attention, as exhibiting the benefits derivable from the direct application of scientific principles to practical purposes. This process is in common operation at Drake Walls tin mine, on the banks of the Tamar. The ore raised in this mine is associated with a large quantity of wolfram, as well as with the ordinary matrix of earthy matters, mixed with a variety of metallic compounds. These are principally silica and alumina, with iron, and arsenical and copper pyrites. The ore, when first brought to the surface, is in large masses, and is then hand-picked and spalled, or broken over, to separate, as much as possible, the earthy matters, and to reduce it to a suitable size for the crushing mill—which consists of a pair of heavy iron rollers revolving against each other, driven either by a water-wheel or steam-engine.

The crushed ore is subjected to a series of washing operations, both in running and in still water, by which means the earthy matters, which are of a much lower specific gravity than the tin ore, are separated therefrom, and the "black tin" of the miner is left associated with the pyrites and wolfram. In this condition the product of the washing is termed witts; and it is also denominated jigged, fluran, smales, slime, or rows, according to its degree of fineness, varying from a coarse grain, about the size of a pea, down to that of the finest flour.

The different kinds are now separately subjected to calcination, at a red heat, in a reverberatory furnace; the sulphur and arsenic of the pyrites are thereby converted into sulphurous and arsenious acids, both of which are, at the same time, volatilised, and carried up the chimney—and thus, not unfrequently, the witts put into the furnace are found at the end of the calcining operation to be reduced to less than one-half of the original weight.

The residue consists of the black tin and wolfram, both of which have resisted the influence of fire, with the oxide of iron and copper of the pyrites. The calcined ore is subsequently removed from the burning house, or furnace, to the "burning house floors," where, by a series of washing operations, the residuary earthy matters are removed, together with the iron and copper—whilst the black tin, or oxide of tin, is left, associated with the wolfram, which cannot be separated by any of the operations already described, on account of its being of greater specific gravity than the tin itself.

Under ordinary circumstances, the ore, by this series of operations, would have been now brought into a saleable form, ready for the smelting-house; and although it formerly obtained a very low price from the smelters, the dressing of the Drake Walls ores was terminated at this stage, until Mr. Oxland invented a process for the supplementary separation of wolfram. This process consists in mixing with the dressed ore a certain proportion of soda ash, the crude carbonate of soda, or of the crude sulphate of soda, with powdered coal, and subjecting the mixture to a calcining operation, at a red heat, in a reverberatory furnace of peculiar construction. The decomposition of the wolfram is effected in the following way:—The tungstic acid leaves the oxide of iron and enters into combination with the soda, producing tungstate of soda, which, being soluble in water, is removed by washing—the oxide of iron, &c., being carried off in mechanical suspension; and the residue consists of the pure black oxide of tin. The tungstate of soda is obtained by the concentration of its solution, and subsequent crystallisation. Ores thus operated on have been increased in value from 42*l.* to 57*l.* per ton; and after charging every expense, without allowing anything for the value of the tungstate of soda produced, a profit has accrued of from 7*l.* to 8*l.* per ton. The tungstate of soda is at this time being introduced as a mordant for dyeing purposes, and in this form it will produce a much more than sufficient amount to repay all the cost of the process, leaving a profit of nearly 20*l.* per ton; and thus, by a simple chemical process, a substance originally prejudicial to the ore is converted into a highly useful agent.

BEET-ROOT SUGAR.

At the last meeting of the British Association, Professor Hancock read a paper "On the Prospects of the Beet Sugar Manufacture of the United Kingdom," of which the following is an abstract:—Public attention had been directed to this manufacture by the effort to establish a public company in London for its introduction into Ireland. He had learnt that, at Maldon, the manufacture had been attempted by a private company; but this attempt led to failure in a short time. A manufactory had been recently established at Chelmsford, and contracts had been entered into with the farmers in that neighbourhood. The prospects of the manufacture depended on the answers to three questions: 1. What was the price of beet-root likely to be for a series of years? 2. What was the price of refined beet-sugar likely to be after 1854? 3. Would it be profitable to carry on the manufacture at these probable prices of the raw produce and manufactured article? As to the price of beet-root, its price varied in France from an average of 13*s.* 11*d.* per ton in the north-east, to 18*s.* 5*d.* per ton in the north-west. The average for the whole of France was 15*s.* 1½*d.* per ton. In Ireland the price stated to be contracted for the Sugar Beet Company was 15*s.* 6*d.* per ton, and the price in Essex was from 18*s.* to 20*s.* per ton. Thus it appeared that the present price in Ireland was higher than the average of France, and the present price in Ireland was higher than the average of the highest priced districts of France. What the future price in Ireland and England was likely to be was a difficult question, and had not been as yet fully investigated. As to the second question—the price of refined beet sugar after 1854—it was necessary to take the year 1851, because at present there was a differential duty in favour of home-grown beet sugar, which would diminish each year, and cease after July, 1854. After that time the short price of refined beet sugar would most probably not exceed 27*s.* to 28*s.* per cwt., and the long price would most probably not exceed 40*s.* 4*d.* to 41*s.* 4*d.* per cwt. Indeed, a fall below those prices might be anticipated from three causes. 1. From the diminished cost of production of refined cane sugar, consequent on the increased consumption produced by the fall of its market price from 49*s.* 4*d.* to 42*s.* 4*d.* per cwt. on the equalisation of the duties. 2. From the removal of the absurd restrictions now imposed on cane-sugar refiners. 3. From the competition between cane-sugar and beet sugar, if the latter were manufactured to any extent.—As to the third question, would it be profitable to manufacture from beet root at the Irish price of 15*s.* 5*d.* per ton, or the Essex price of 19*s.* per ton, refined sugar to sell at 28*s.* per cwt? The calculations on this point which had been most relied on were two in number—that of Mr. W. K. Sullivan, chemist to the Museum of Irish Industry in Dublin, and that of M. Paul Hamoir, of the firm of Serret, Hamoir, Duquesne, and Co., the largest manufacturers of beet-sugar at Valenciennes, dated 18th of April, 1850. These estimates were as follows:—

MR. SULLIVAN'S ESTIMATE FOR IRELAND.

60,000 tons of beet, at 15*s.* per ton	£15,000
Cost of manufacture, at 9*s.* per ton of beet	27,000
Total outlay	72,000
Produce, 5 per cent. of sugar, at 28*s.* per cwt.	93,000
Estimated profit	£21,000

SAME ESTIMATE APPLIED TO ESSEX.

60,000 tons of beet, at 19*s.* per ton	£57,000
Cost of manufacture, at 9*s.* per ton of beet	27,000
Total outlay	84,000
Produce, 5 per cent. of sugar, at 28*s.* per cwt.	93,000
Estimated profit only	£9,000

M. PAUL HAMOIR'S ESTIMATE FOR FRANCE.

61,697 tons of beet, at 12*s.* 11*d.* per ton	£38,400
Cost of manufacture, nearly 13*s.* per ton of beet	39,900
Total outlay	78,300
Produce, 4½ per cent. of sugar, at 39*s.* per cwt.	114,000
Estimated profit in France	£35,700

SAME ESTIMATE APPLIED TO IRELAND.

61,697 tons of beet, at 15*s.* 6*d.* per ton	£46,080
Cost of manufacture, nearly 13*s.* per ton of beet	39,900
Total outlay	85,980
Produce, 4½ per cent. of sugar, at 28*s.* per cwt	81,430
Estimated loss in Ireland	£4,550

SAME ESTIMATE APPLIED TO ESSEX.

61,697 tons of beet, at 19*s.* per ton	£58,527
Cost of manufacture, nearly 13*s.* per ton of beet	39,900
Total outlay	98,427
Produce, 4½ per cent. of sugar, at 28*s.* per cwt.	81,430
Estimated loss in Essex	£16,997

From these simple calculations it appeared at once that, by only introducing into the estimates the Irish and English prices of beet-root and of refined beet-sugar, the result was so varied as to turn a profit of 35,000*l.* at the French prices, on a capital of 78,000*l.*, into a loss of 4000*l.* at the Irish prices, and a loss of 16,000*l.* at the Essex prices. It followed, therefore, that the French estimate did not, as had been alleged, corroborate Mr. Sullivan's estimate; on the contrary, it showed how fallacious it was to reason from the success of the manufacture in France to its success in the United Kingdom, without taking into account the difference of the prices of beet-root and refined beet-sugar in both countries—the difference in economic conditions between the two countries being alone sufficient to make that which was profitable in France unprofitable here. The manufacture of beet-sugar had been first commenced in France when the continental system of Napoleon and the retaliation of England had almost excluded cane sugar from France. From that time to the present, beet-sugar had always had the protection of an artificial price—(the present price being 39*s.* per cwt. in France as compared with 28*s.* per cwt. in this country). In every other country in the world where beet-sugar had been produced it had the protection of an artificial high price. The conclusion was manifest, therefore, that, from any calculations yet submitted to the public, it appeared that the manufacture of beet-sugar could not be profitably carried on in the United Kingdom.

THE CEYLON DEPARTMENT.

FOREIGN AND COLONIAL DEPARTMENTS.

CONTRIBUTIONS FROM CEYLON.

FEW, if any, of our Eastern possessions were fairly represented at the Great Exhibition, not even the East Indies, where all the power of the Company was brought to bear. This has been in great part owing to the shortness of time permitted for the collection of objects; but many complaints have been made in the colonies that they received no official notice of the Exhibition for two or three months after it had been mentioned in the papers, and that therefore no persons felt inclined to act. Added to these delays were the indifference of the native population in Ceylon and elsewhere, and the natural obstacles of climate, difficulty of transport, &c., peculiar to those tropical regions.

As regards Ceylon, it was not until March, 1850, that a local committee was formed; and to ensure the arrival of the goods by the prescribed time, the 1st of March, they had to be shipped by the end of September, thus leaving but six clear months for articles which required at least a year. The consequence was that there was scarcely anything exhibited in that art for which the natives of Ceylon have been justly celebrated, that of carving in wood and ivory. It is quite impossible to persuade a Cingalese carver to work faster than is his custom; he will not depart from long-established usage. The ivory-work of Ceylon is scarcely known in Europe, and it is deeply to be regretted that no worthy specimen of this species of carving arrived on this occasion. The inlaid furniture of ebony, calamander, &c., is perhaps unequalled in any part of the world; yet but two specimens came to hand.

Ceylon is prolific in fibrous materials, many of which are well adapted as substitutes for flax and hemp. Some of these were shown in the raw and manufactured state.

The earthenware of the Cingalese is more curious than valuable; the art of pottery with them being, in all probability, not more

advanced than in the time when Ptolemy and the Arabian navigators first visited

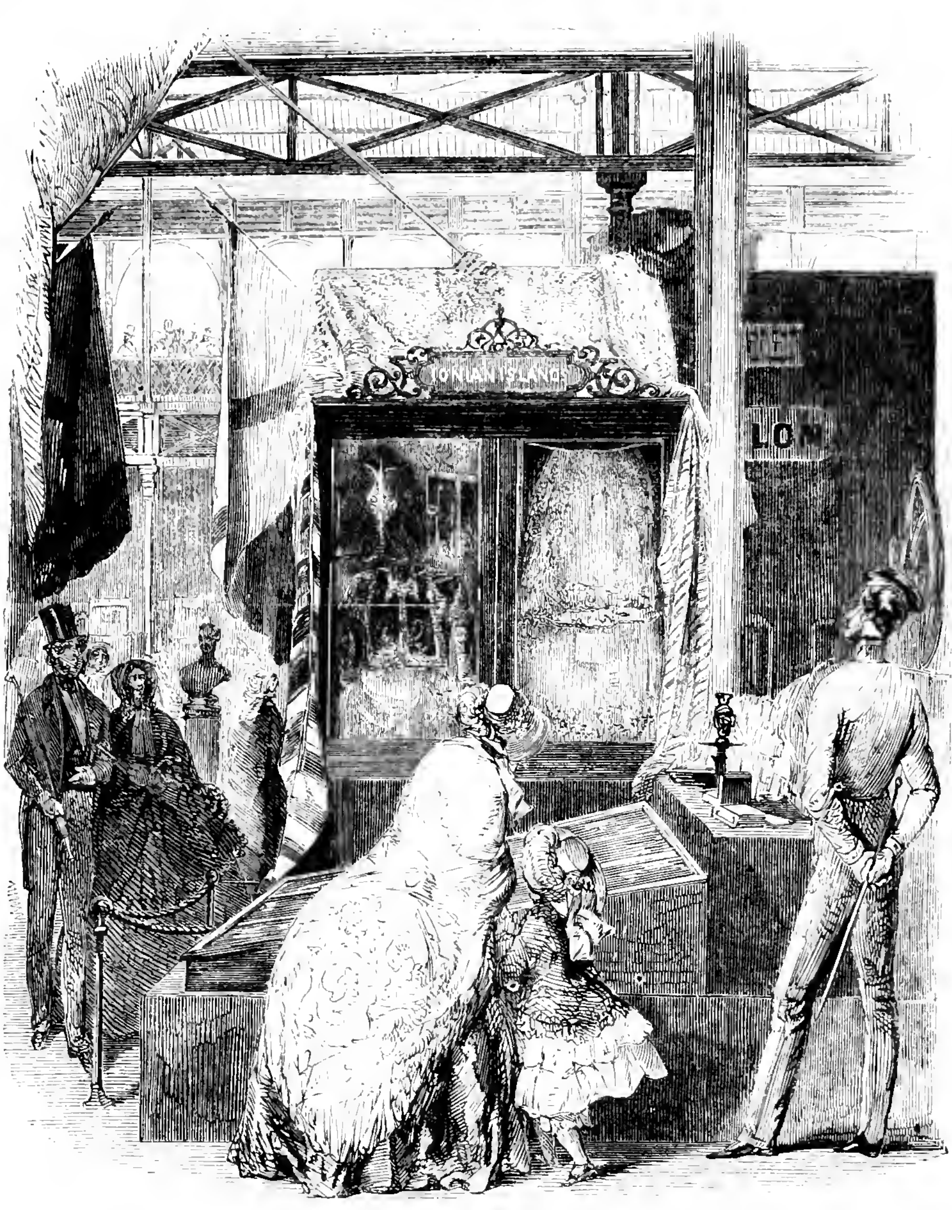
The utmost Indian isle, Taprobane.

The same remark will apply with equal truth to their agricultural and manufacturing implements. The Cingalese women may still be seen grinding their corn, "two at one stone," as described in Scripture.

The bows and arrows employed by the wild Veddahs of the Ouvah and Bintenne districts, in the hunting of deer and buffaloes, are remarkable for little beyond their simplicity and diminutiveness.

The coffee, the cinnamon, and the cocoa-nut oil of Ceylon are articles well-known in the commercial world: they are equal, if not superior, to the production of any other country. There were also to be found models of the buildings, machinery, and implements employed in coffee plantations in Ceylon. Models of the Cingalese fishing-canoes, which are of very singular and beautiful construction, unlike those of any other country, were displayed with their nets and gear on a proper scale.

First in value and importance were specimens of *cinnamon*, a spice highly prized from long antiquity, and peculiar to the "utmost Indian isle." Java has in vain attempted to produce cinnamon that should rival the fine spice of Ceylon, and the rough coarse bark grown on the Malabar coast cannot be compared with it. The Portuguese and Dutch preserved a strict monopoly of the cultivation and trade in this article; and it was not until the year 1833 that the British Government threw open the privilege of dealing in it to the public. Since that period, the preserved Spice Gardens have been sold, and are now cultivated by private parties. It is sorted into three qualities, and is just now worth an average price of 2*s.* the pound in this market.



CONTRIBUTIONS FROM THE IONIAN ISLANDS.

Cinnamon is the bark of the *Laurus cinnamoni*, freed from its outer cuticle, and removed from the sticks in long narrow slips: these pieces of bark are rolled into *pipes* or *quills*, in layers of three or four, and are dried gradually, first in the shade, and then in the sun.

A cinnamon plantation of 800 acres will produce annually 400 bales of spice, of 100 lb. each. The present consumption of cinnamon of Ceylon growth is about 3500 bales per annum, of which not more than the 500 are used in this country; the remainder are taken chiefly by France, Spain, and South America.

Of far more recent date, though equally important as an article of commerce, is *coffee*. Twenty years ago, the *Caffea arabica* was scarcely known in Ceylon. It was not until the years 1832 and 1834 that a very few Europeans commenced the cultivation of the coffee-bush. There are now 300 estates, comprising 50,000 acres of land, all under coffee; the shipments amounting to 350,000 cwt. annually. This article is all grown inland, at various altitudes, the best being from the highest estates.

Coir fibre and rope are made from the outer husk of the cocoa-nut; the kernel of the nut yielding a large quantity of oil by pressure, which is exported to Europe in large quantities.

Paddy is rice with its natural skin upon it, and in this state is given to all sorts of cattle and poultry. The rice of Ceylon is not nearly so fine as that brought to this country from Carolina and Bengal, but it has very nutritious qualities, and the Cingalese and many Europeans prefer it to any other description.

The *woods* of Ceylon are scarcely inferior to those of any other country, and exist in great variety. There are upwards of four hundred kinds, of which one-half are employed for a variety of purposes, the remainder being useless. The ornamental woods are ebony, calamander, satin, cocoa-nut, peyimbeya, teak, tamarind, jack, palmyra, &c. The most abundant of the woods used for house and ship-building, of which specimens have been sent, are halmanilla, teak, morotto, dawete, mango, keena, hall, and horra.

Besides *coir*, there are several fibrous substances in Ceylon capable of being turned to useful purposes. Amongst those forwarded to the Exhibition were fibres, both in their natural and prepared state, from the pine-apple, hibiscus, plantain, *Sansevcira zelonica*, and Adam's needle.

There are a number of gums and resins in Ceylon unknown in this country, most of which are employed medicinally by the native practitioners. Besides these, a collection of medicinal plants, roots, and seeds, in a dried state, was exhibited. Many of them possess valuable properties, well known in Ceylon, in the removal of fever, dysentery, liver, and cholera. The Dutch and Cingaleso doctors seldom have recourse to any but vegetable medicines, and these are often found to succeed where European remedies have failed. The collection was forwarded by Mr. T. Piries of Kandy.

Under the head of Machinery, Implements, &c., we observed three models of the various works and their fittings, as employed on coffee estates. First, there was the *pulping-house*, with its *pulpers, cisterns*, &c., for removing the outer red husk of the coffee berry; and afterwards washing the mucilage from it. Next came the stove, and moveable trays running on wheeled platforms, whereon the washed coffee is exposed to the sun in its inner covering of parchment-skin. When thoroughly dried to a flinty hardness, the berries are removed to the adjoining building, the peeling-house, where a pair of copper-covered wheels are revolving in a circular trough, under which the parchment rapidly breaks, and becomes detached from the coffee beans.

Near these was another model of a stove for curing coffee. This is of peculiar construction, and fitted up according to a process which has been patented by the ingenious inventor, Mr. Clershew, of the Rathongodde estate. It is formed on the principle of curing the coffee whilst in the *parchment* by means of a current of hot air, to be used during weather when out-of-door drying would be impossible.

The models of Cingalese palanquins must be regarded rather as curiosities than as specimens of fine work. Too much praise, however, can

INLAID WOOD TABLE, FROM CEYLON.

scarcely be accorded to the construction of the three Cingalese boats, which are unique, not only as specimens of handicraft, but as models of very singular and beautiful vessels. The long sailing canoe, to be fully admired, should be seen in full sail when going at a speed of fourteen miles the hour, which it frequently does. The flat-bottomed fishing dhoney, with its nets and accoutrements, is a very pretty thing. The large dhoney is such as is employed in the coasting trade of Ceylon, for the transport of rice, tobacco, salt, betel-nuts, &c. They vary in size from 30 to 200 tons, and not the least singular feature about them is, that not one iron nail is used in their build, nothing but wooden pegs and coir string holding the planks and beams together.

The plough, harrow, and rake of the Cingalese agriculturist attest the little improvement effected in their operations, which have no doubt remained unchanged during the last 1800 years.

Amongst manufactured articles, the most attractive was, undoubtedly, a table and stand of ebony, richly carved, and beautifully inlaid with fifty variously-tinted woods of Ceylon. There was also a desk composed of porcupine quills, a carved ebony box, an ivory stand in imitation of a cocoa-nut blossom, and some other trifles. These form but a tithe of what might have been exhibited, had time permitted.

There were some rather grotesque specimens of native pottery, the only one worthy of notice being a painted tea pot used by the king of Kandy, which was of immense size.

There were a number of specimens of cordage, &c., woven from the fibres previously named: also a pretty Kandian mat, and several ornaments displayed by the Kandian kings on state occasions, made from fibres, and dyed with indigenous roots.

The Veddah bows and arrows exhibited were such as are actually employed in the present day by a wild and almost unknown race of Cingalese, in the pursuit of deer, buffaloes, and wild boars. This singular cast of aborigines dwell entirely amongst rocks, or perched in trees like monkeys, living chiefly on roots, seed, and a little deer or buffalo flesh.

The manufactured oils of Ceylon are numerous, though most of them are at present unknown in this country. They may be divided into medicinal and commercial. Many of the former are said to possess valuable properties, yet, with the exception of the castor oil, they are not known to any but native practitioners. These were forwarded by Mr. Piries, of Kandy. Of the oils of commerce, the cocoa-nut, cinnamon, lemon-grass, citronella, and kekuna are tolerably well known, the first being highly useful for burning in lamps; the second is chiefly employed in medicine and confectionary.

Arrack is a spirit distilled from the fermented juice of the cocoa-nut tree, called *toddy*, and has long been known in England as forming the chief ingredient of Vauxhall punch. The sample sent is very curious, having been upwards of thirty years in bottle, and coming originally from the cellar of the last Dutch Governor of Ceylon.

THE IONIAN ISLANDS.

THE Ionian Islands is the collective name given to a straggling group of islands in the Ionian Sea, off the west coast of Albania, and of the seven principal of which the following table gives the names, area, and population, in 1844.

	Area in square miles.	Population in 1844.
Corfu	227	64,676
Cephalonia	348	69,984
Cerigo	116	11,694
Santa Maura	180	18,676
Paxo	26	5017
Theaki	44	10,821
Zante	151	38,929
Totals	1097	219,797

They are included in the list of British Colonies, because although nominally a republic, they were by the treaty of Paris, 1815, put under the

SILVER BROOCH, FROM THE IONIAN ISLANDS.

protection of the Sovereign of the British Empire, who exercises his authority, through a Lord High Commissioner. By the Constitutional Charter of 1817, the executive government is reposed in a Senate, composed of six members, of whom the President is nominated by the Crown of England, upon the recommendation of the Lord High Commissioner. The rest of the senators are chosen by the Legislative Assembly, from amongst their members, with the approbation of the Lord High Commissioner. The Legislative Assembly consists of forty members, of whom eleven are chosen by the Lord High Commissioner, and are styled the Primary Council, or integral part of the assembly. The other twenty-nine are chosen by the elective bodies of the various islands, which are in proportion to their population, with the proviso only,—that they must be chosen from lists of candidates prepared by the Primary Council. It will be seen therefore that the power of the British Government, through its representative, is to all intents and purposes absolute: there being no original authority, executive or legislative, to dispute his will.

The expenses of government for 1844 were 143,198*l.*, the revenue 120,236*l.* There is a state debt, but the amount we are not aware of.

These islands rise in irregular rugged abruptness from the sea, and consist chiefly of limestone, gypsum, and sandstone. The climate is beautiful, though occasionally oppressively hot. Earthquakes and hurricanes are not uncommon. The available land for agricultural purposes amounts to about 500,000 acres. The chief productions are the olive, corn, some cotton, flax, and currants; the best of the last named in Cephalonia and Zante. The annual produce of currants is between 17,000,000 and 18,000,000 pounds; that of olive oil, from 100,000 to 120,000 barrels, and that of wine about 200,000.

There are few or no manufactures. Earthenware, salt, soap, and some coarse woven goods are the principal industrial products. Ship building and the fisheries give employment to a considerable number of hands. The coasting trade is important. The import consists of sugar, coffee, tobacco, and drugs; raw and manufactured silk and cotton; wool, and woollen cloth; glass, hardware, iron, timber, staves, Indian corn, rice, cattle, sheep, &c. The import and export is chiefly carried on in British ships. The average value of imports is about 630,000*l.*, of which in 1849, those of British produce amounted to about a quarter, or 165,805*l.*

Though the above statement would not lead us to expect a very extensive or varied display of contributions from this little *soi-disant* republic, it might warrant us in expecting something, at least on a par with Ceylon, Tunis, and other primitive states, which have as yet felt but in a small degree the influence of the modern. And surely such would have been the case, if the inhabitants had received any encouragement from the present High Commissioner, Sir Henry Ward, to mingle with others in the world's fair. Why his Highness has neglected to do so, and why, as

far as native exhibitors go, the Great Exhibition has been to the Ionian Islands a blank, are circumstances upon which we are left to indulge in what reflections we may. Certainly they constitute a fact which does not say much for our civilizing influence, when exercised in the form of a protectorate.

The Official Illustrated Catalogue states that, "owing to some misapprehension, the Ionians were without knowledge of the objects and purports of the Exhibition of 1851, until very recently. Unwilling, however, that the name of the Ionian Islands should alone be wanting in the list of nations on this great occasion, the Executive Committee appealed to an Ionian gentleman, who has been induced to collect together the kind contributions of certain noble and eminent individuals who have served her Majesty in these islands (there are in all six exhibitors) such articles in their possession as might serve as specimens, to a trifling extent, of the products, skill, and industry of the Ionians."

These products are principally articles belonging to the classes of textile and ornamental manufactures. The specimens of embroidering are extremely rich and beautiful. The filagree work is delicate, and illustrates a department of skill in the working of precious metals which has no representative in this country.

In the case shown at the top of our engraving is a gold embroidered Greek jacket, and two tastefully bordered knitted aprons, the work of a peasant girl at Corfu; below it, in a case, are silk scarfs and handkerchiefs, from Zante; purses, cigar-cases, tobacco-boxes, and bags in gold embroidery on velvet, the work also of peasant girls (and very tastefully worked they are), at Santa Maura; and gold and silver bracelets, brooches of hammered and filigree work, from Corfu.

Lord Seaton exhibited a large silver brooch, of which we give an engraving. It is of extremely elegant design, and of the finest workmanship, combining in the centre the lion and crown of England, as a large medallion, with seven medallions of the seven islands depending from it. The centre medallion represents the arms and emblem of the island of Corfu—"The flower of the Sea"—a female figure, supposed to be Corcyra, the daughter of Asopus, who was carried off by Neptune to the islands, seated upon a rock, holding in the hand of her extended right-arm an olive-branch. On the one side of her is a cornucopia, denoting the fertility of the island; and the other, an ancient galley, emblematic of the commercial spirit and wealth of its inhabitants. This ship, which is rudderless, sometimes stands alone as the arms of the island, and has been also supposed to take its origin in the ship of Ulysses, which was fabled to have been transformed into a rock, somewhat of the figure of an ancient vessel, which now stands at the entrance of the harbour. The letters Κερ are the abbreviation of Κερκυρα, the ancient Corcyra.

The medallion, on the right, is marked by a tripod for Zante, and the letters Ζακ, the abbreviation of Ζακυνθος.

The next to this, on the right, is the medallion of Santa Maura. The harp upon it symbolises its fame, as the death-place of Sappho; the letters λευ being the abbreviation of its ancient name Λευκαδια, Leucadia. Another emblem of this island is Bellerophon, on a winged horse, attacking the Chimæra, which it derives from its Corinthian colonisation.

The last on this side is Ithaca, marked with the head of its king Ulysses; the letters Ιθα being the abbreviation of Ιθακη, Ithaca.

On the right of the Corfu medallion is that of Cephalonia, the next island in magnitude, represented by Cephalus, the son of Mercury and Creuza, who, when condemned by the court of Areopagus to perpetual exile for having unwittingly killed his wife Procris, came to dwell upon this island. He is represented as reposing after the chase, a dart in his hand, and his dog at his feet. The letters Κεφ are the abbreviation of Κεφαλλήνια, Cephalonia, the ancient designation of the island.

Cerigo comes next. The letters Κυθ denote Κυθαίρα, the ancient Cythera, represented on the medallion by Venus, to whom the island was sacred, and who was fabled here to have had her birthplace and her domicile. The goddess is standing on her shell, drying her hair with the one hand, and holding in the other the famous apple.

Paxo, the smallest of the islands, comes last. Its sacredness to Neptune is denoted by his trident. The letters Πα are the abbreviation of Παξο, Paxo. This island is also represented by the helm, or rudder, of a ship within an olive garland.

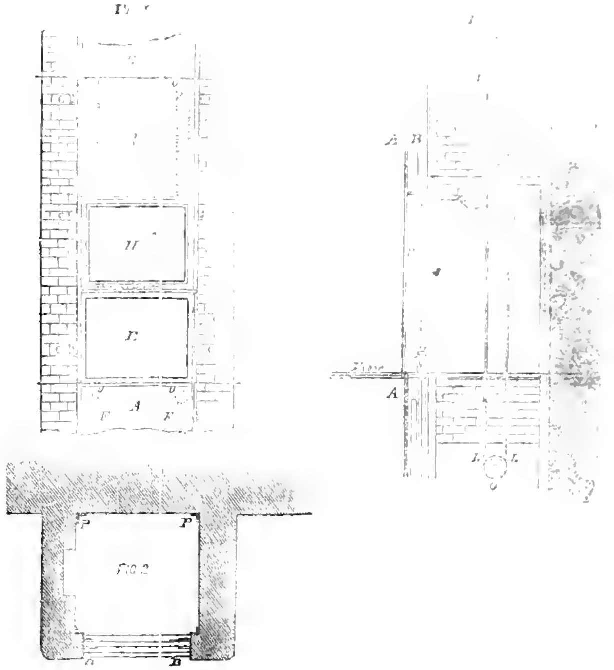
ARCHITECTURAL AND BUILDING CONTRIVANCES.

BELLHOUSE'S FIRE-PROOF DOORS FOR WAREHOUSE HOISTS.

THE recent fires in Manchester—especially those of George-street and York-street, and more particularly that of Westhead's warehouse, in Piccadilly—have caused every feasible scheme for the prevention of this disastrous cause of destruction in so vast a town, whose buildings are chiefly filled with stores of valuable produce, to be regarded with attention. In the manufacturing districts generally, where the warehouses and factories are a considerable height, consisting of many stories, the ordinary staircase is generally superseded by the "hoist" or "lift," which is precisely the same thing as the well-hole of an ordinary staircase previous to the stairs being fixed therein, but with the addition of the hoisting or lifting apparatus. Mr. Bellhouse, who is an extensive builder in Manchester, has particularly turned his attention to a mode of preventing such well-holes from becoming, in case of fire, large ventilators [illegible] cause the fires to rage with greater fury. The means [illegible] for this purpose, and a model of which was exhibited in the [illegible] department, consists of iron doors sliding vertically in grooves [illegible] of the same material, so that the communication between the different [illegible] of the building and the well-hole may be entirely shut off in case [illegible].

The illustrations consist of an elevation (Fig. 1), plan (Fig. 2), [illegible] section (Fig. 3).

Hollow iron bricks, C C, are built into the brick walls of the well-hole as the building progresses; B B are side jambs of [illegible], having slides for the doors, the jambs being bolted to the hollow bricks; A A, are stone plates of cast iron bolted to the side jambs, which plates form the [illegible] in the case of one doorway and the sill of the next. H and E represent two sliding doors, the former opening upwards, and the latter downwards. The doors are moved either upwards or downwards by means of chains, [illegible],



BELLHOUSE'S FIRE PROOF DOORS FOR WAREHOUSE HOISTS.

which are attached to the upper angles of the door, E E; the chains pass downwards, in grooves formed in the sides of the upper door, H, and over pulleys, U U, and are fastened to the upper side of the door H. Hence, in whatever direction the door H is moved, the other door, E, must necessarily have the reverse movement. The weight of the doors is so adjusted, that the excess of weight in the door H causes them both to close when left to themselves.

The slides or grooves in which the doors move are so arranged as to prevent them coming into contact with each other. In order to keep the doors open while the cradle is being loaded or unloaded, an apparatus of simple construction is attached to its interior. S is a bolt sliding to the left and right; T is a link connecting the bolt S with a point which slides perpendicularly in a groove as shown. If this point be moved upwards from the position shown, the bolt will be moved towards the left: and if the cradle is stopped at any particular place, and the doors open, the bolt will keep them in that position; but as soon as the cradle has to be removed, the bolt being withdrawn for this purpose, the balanced doors, H and E, are allowed to close. Let us take a case: the cradle has been left opposite to a door at the top of the well-hole, and a person at the bottom wishes to liberate the hoist: having first given notice by "Whishaw's telekouphonon," or speaking telegraph, of his intention, he withdraws the bolt S S, by means of the rope passing over the pulleys, O O, at the top and bottom of the well-hole, and at the same time ensures the closing of the doors as already mentioned. By these self-closing arrangements, none of the apertures communicating between the apartments and well-hole need be left open, and the sliding doors are themselves fire-proof.

MESSRS. BROADWOOD'S GRAND PIANO, manufactured for the Great Exhibition has been most generously presented to the Royal Society of Musicians: its sale to be appropriated to their funds, which have already been enlarged by previous donations. The workmanship of this magnificent instrument has cost nearly 600*l.*—*Art Journal.*

GROUP OF CHINA FROM BAVARIA.

POTTERY, PORCELAIN, TILES, &c.

(Continued from page 148.)

DRESDEN AND OTHER GERMAN MANUFACTURES.

NOTWITHSTANDING the futility of the means resorted to for keeping secret the processes at Meissen, these means were continued with the same rigour long after most of the processes and materials used in the manufacture of Dresden porcelain became known, and when other manufactories of fine porcelain had been established in various parts of Europe.

So late as the year 1812, the late M. Brogniart, director of the Royal manufactory at Sèvres, was sent by the Emperor Napoleon to inspect the porcelain works of Germany, and, among others, he visited those of Meissen. So rigorous, however, was the system of exclusion and secrecy then practised, that in order to obtain admission the King, at the special request of Napoleon, solemnly released M. Kuhn, the director, from his oath of exclusion, so far as related to M. Broguiart, but refused to extend the same favour to the associate who had been sent with Brogniart by the Emperor.

The style of the Dresden porcelain is familiar to all amateurs, and, whatever difference of opinion may prevail as to its taste, there can be none as to the admirable excellence of its execution. All who have visited the collection at Dresden will be familiar with the series of animals represented on a tscale approaching to the natural size, inlcuding bears, rhinoceroses, vultures, peacocks, &c., made for the grand staircase which conducts to the electoral library. These were fabricated as early as 1730. At a later period, when the manufacture had undergone improvements, large ornamental pieces of porcelain were made, such as slabs of consoles and tables,

PORCELAIN VASES &c.—MANSARD OF PARIS.

ome of which measure from 45 to 50 inches by 25, and are richly de-
orated with flowers.

Among the varieties of Dresden porcelain the grotesque figures and roups have always been much admired for their execution, if not for their tyle. The costumes are especially admirable, and the representation of ine work, such as lace, truly wonderful. Some specimens of this were to e seen in the Exhibition. One of the grotesque pieces which has attained ost celebrity, and is familiar to all amateurs, is the famous tailor of the Count e Bruhl, a figure which is remarkable for the difficulty of its execution, wing to the numerous accessories which it includes. The figure of the ailor is represented riding on a goat surrounded with all the implements nd appendages of his trade, and is about twenty inches in height. This elebrated group was composed by Kündler in 1760, and is usually sold for bout 12*l.*

The Dresden manufacture has always been remarkable for its representa-ion of flowers; and a beautiful specimen of this work was in the Exhibition, onsisting of a camelia japonica with leaves and white flowers in porcelain n a gilt pot on a stand of white and gold porcelain. This article was priced t 90*l.*

Among the other articles exhibited by the Royal manufactory of Meissen ay be mentioned two vases of light blue, with portraits of the Queen and Prince Albert, adorned with escutcheons filled with flowers and rich gilding, vith postaments of a like description; a girl playing a guitar, with laces; fluteplayer; an *étagère* with girandoles in flowers in relief; a picture of he lacemaker, after Slingeslandt—price, 50 guineas; a figure of Ganymede, fter Thorwaldsen; and statuary porcelain.

Besides the ornamental porcelain exhibited by the Royal manufactory, wo collections of paintings on china after classical pictures were exhibited y the well-known artists of Dresden, Henry Bucker and Gustavus Walther. I. Bucker exhibited 11 paintings in gilt frames, from Correggio, Carlo

GROUP OF PORCELAIN, FROM MEISSEN, IN SAXONY.

GROUP OF SEVRES PORCELAIN.

Dolce Titian, Murillo, Gessi, Guido Reni, Raffaelle, Mengs, Pattoni, and Leotardi. The prices of these paintings vary from 6*l.* to 20*l.* The same artist exhibited 18 paintings of larger size, varying from 18*l.* to 90*l.* after Murillo, Titian, Holbein, Guido Reni, Correggio, Raffaelle, Sasso Ferrato, Ruysdael, Claude Loraine, &c.

M. Walther exhibited six large paintings, varying in price from 16 to 42 guineas, after Cignani, Correggio, Guido Reni, Murillo, and Raffaelle.

The Imperial Manufactory of Porcelain of Vienna was established in the year 1744. One of the foremen of Meissen, named Stobzel, had deserted from that establishment about the year 1718, and escaped to Vienna, where, aided by a Belgian named Pasquier, and favoured by a privilege, or a sort of monopoly, for 25 years, granted to him by the Emperor Charles VI., he established, in 1720, a small porcelain manufactory. Not having, however, sufficient capital to carry it on, it declined, and was finally purchased by the Empress Maria Theresa in 1744, and erected into a Royal manufactory. During nearly 20 years it required considerable subsidies for its support, but at length, by good management, it became profitable in 1760, and in 1780 yielded an annual profit of about 4000*l.* The number of operatives who were lately employed in this factory was about 400. The kaolin or porcelain clay used in this factory, until 1812, was obtained from the neighbourhood of Passau, on the confines of Bavaria, and from Prinzdorf, in Hungary. Lately, however, it has been supplied by clay obtained from the neighbourood of Brün, in Moravia, and Unghbar, in Hungary. As deserters from Meissen were instrumental in establishing the manufactory of porcelain at Vienna, deserters from Vienna soon spread the knowledge of the art to a greater or less extent in other parts of Germany. Thus Ringler, one of those who had originally deserted from Meissen to Vienna, again escaped from Vienna to Munich, where he was appointed director of the porcelain works established in 1758 at

Nymphenburg, within a few miles of that city. This establishment still continues, and is now the Royal porcelain manufactory of Bavaria. The white biscuit is manufactured at Nymphenburg, and its ornamentation effected in workshops at Munich. The porcelain clay used in this manufactory is obtained near Passau, already mentioned, the feldspar from Raberstein, in Bavaria, and the quartz from Abensberg, near Ratisbon. It was, in like manner, by means of information brought by deserters and runaways from factory to factory that the fabrication of porcelain came to be established successively in the Royal manufactories of Louisberg near Stuttgard, at Berlin, Copenhagen, Brunswick, and St. Petersburg.

Berlin.—After the peace of Hubertsburg, Frederick II. of Prussia, erected the Royal manufactory of Berlin. While he was master of Dresden he sent a considerable quantity of the porcelain clay of Meissen, and several of the operatives of this factory, to Berlin, to aid in the establishment of the manufactory in that city.

Sèvres Porcelain.

While the fabrication of porcelain thus made progress in Germany, a factitious paste was introduced in France of which a porcelain was manufactured, since known by the title of *tender porcelain*, as distinguished from the *hard porcelain* of Germany and China. This ware, fabricated by a process complicated and expensive, differed altogether from the porcelain of China and Japan, and, in spite of its brilliant qualities and the gorgeous ornamentation of which it was eminently susceptible, means were still sought in France for fabricating a hard porcelain, which were not discovered and brought into practice for 69 years after the establishment of the manufactory of Meissen.

At length a vein of clay of the finest quality was discovered by accident, which again played a remarkable part in the history of this manufacture. Madame Darnet, the wife of a village surgeon, residing at St. Yrieix, near Limoges, accidentally found in a valley in the neighbourhood of that town a white unctuous earth, which she regarded as being capable of being rendered useful in the washing of linen. With this purpose she showed it to her husband, who, better informed, suspected other and more valuable effects in it, and undertook a journey to Bordeaux to submit it to a chemist of that place, named Villaris. This person, who had been already informed of the qualities necessary for porcelain clay, and of the eagerness with which it was sought for, suspected that the specimen brought to him by M. Darnet possessed these qualities. It was accordingly sent to Macquer, the chemist at Paris, who was then occupied in experiments on the improvement of porcelain. He immediately recognised in this specimen of clay the true kaolin, and went to St. Yrieix in August, 1768, where he found a large vein of this precious material. Experiments were made upon it upon a large scale at Sèvres, where all doubts upon the subject were soon removed; and the kaolin of St. Yrieix, near Limoges, was immediately adopted as the material, and the fabrication of the hard porcelain on a considerable scale was commenced.

M. Brogniart relates a curious and interesting anecdote connected with this subject. He says that, in 1825, being at Sèvres, where he was still director, an aged woman addressed herself to him one day supplicating temporary relief, and apparently suffering from extreme want. She asked for aid to enable her to return on foot to St. Yrieix, whence she had come. This woman was Madame Darnet, the discoverer of the kaolin of Limoges. The relief she sought was immediately given to her; and on the application of M. Brogniart Louis XVIII. granted her a small pension on the civil list, which she enjoyed till her death.

The progress of the manufacture of porcelain in France was marked by two epochs—the first commenced from 1700, about which time the manufacture assumed a national character, and the second commencing in 176[illegible] the date of the discovery of the kaolin of Limoges.

During the first interval the French porcelain was that known by th[e] name of the *porcelaine tendre*, or tender porcelain. This ware was compose[d] of an artificial paste which contained no porcelain clay whatever. Th[e] factitious paste was composed of nitre, sea salt, alum, soda, gypsum, an[d] sand, which, being reduced to a frit, was mixed with about one-third of i[ts] own weight of white chalk and calcareous marl. The paste thus prepare[d] having scarcely any plasticity, did not admit of being shaped in a moi[st] state on the potter's lathe, and was with difficulty even moulded. Wh[en] the article was roughly joined by moulding, and rendered hard by exposu[re] to the air, it was put upon the wheel and reduced with a cutting tool to i[ts] exact form. But, as it was liable, from its want of tenacity, to crumble [in] this operation, a solution of tragacanth gum was added to it, to which w[as] attributed the saline efflorescences which were occasionally manifested [on] the articles fabricated. In the process of turning the moulded pieces [a] saline and silicious dust was produced, which was extremely injurious [to] the potters, and caused asthmatic and pulmonary complaints. This w[as] one of the reasons why the fabrication of tender porcelain was the mo[re] readily discontinued after the discovery of kaolin.

Owing to the want of plasticity and coherence in this artificial past[e] great difficulties were encountered in the several stages of its manufactu[re].

The want of tenacity rendered it necessary, when the articles were plac[ed] in the oven, to support all the projecting parts during the process of baki[ng] and, in order that the forms of these parts might not be distorted, it w[as] necessary that their supports should be formed of the same paste as t[he] articles themselves, so that the whole mass, including the supports, mig[ht] contract together. The linear dimensions contracted in the baking by on[e] seventh, and consequently the bulk or volume of the article was diminish[ed] in proportion of three to two.

The epithet *tender* applied to this porcelain must not be understood [as] implying the quality of softness. It is intended, on the other hand, [to] express two qualities by which it is distinguished from the hard porcelai[n]: first, that the paste is fusible at a certain temperature lower than that [at] which the hard porcelain is baked; and secondly, that the glaze is so s[oft] that it may be scratched with a steel point.

The Royal manufactory of Sèvres continued to fabricate this tend[er] porcelain exclusively until the discovery of the kaolin of Limoges, alrea[dy] mentioned, in 1765. After that time both kinds of porcelain, the hard a[nd] the tender, were manufactured, but the former in much larger quanti[ty]. The fabrication of the tender porcelain was not altogether discontinu[ed] until 1804.

Among amateurs in porcelain, including even those who are otherw[ise] well informed, there prevails a notion that the art of fabricating the tend[er] porcelain of Sèvres has been lost, and that, since it is impossible to reprodu[ce] the articles, they must necessarily have a high value in the market. Th[is] however, is erroneous. All the materials and processes for the fabricati[on] of this description of artificial porcelain are preserved at Sèvres, and i[ts] manufacture can be re-established whenever it is desired to do so. Inde[ed] we are informed at this moment that the Administration entert[ains] an intention of recommencing the fabrication of this description of porcel[ain] for articles of ornament, such as vases, pictures, &c., the imperfectio[ns] incidental to it not affecting such objects.

All the Sèvres porcelain in the Great Exhibition was of the kind call[ed] *hard*, that being the only description fabricated in Sèvres for the l[ast] 50 years.

The portraits of the Queen and Prince Albert, which were exhibited [in] the great aisle of the Crystal Palace, are fine specimens of the larg[est] porcelain painting which have been produced at Sèvres. These portrai[ts] after Winterhalter, were executed by command of Louis Philippe, a[nd] presented to the Queen. They were commenced before the Revolution [of] February, but not finished until afterwards. Louis Philippe claimed the[m] as his private property, and they were surrendered to him by the Repu[b]lican Government; but the portrait of Prince Albert had met with [an] accident, by which it was broken. Louis Philippe desired to have anot[her] made, but the Queen would not hear of this expense being incurred, a[nd] the fracture being repaired at Sèvres, the portraits were sent to Engla[nd] and delivered to Her Majesty.

Among the splendid collection of paintings and vases exhibited by t[he] National manufactory of Sèvres the most valuable and most worthy [of] attention and examination are the following:—

The painting of the Virgin, known as the *Vierge au Voile*, by Madam[e] Ducluzeau, is copied from the celebrated picture by Raffaelle in the Louv[re]. The porcelain is of the same magnitude as the original, and measures [illegible] inches by 19. This work was executed in 1847-8, price 1000*l.* Anot[her] painting after Tintoretto, on a plate of porcelain 45 inches high, by Madam[e] Ducluzeau, price 880*l.* A flower subject on a plate of porcelain, 40 inc[hes] high, by M. Jacobber—800*l.* A portrait of the President Richardeau, [by] M. Beranger—440*l.* A portrait of Vandyck, by Madame Ducluzeau—28[illegible] A painting on a plate of porcelain eight inches high, reduced fr[om] Raffaelle's "Madonna," by M. Constantin—100*l.* A large cup, 45 inc[hes] diameter and 34 inches high, porcelain biscuit; the three principal figu[res] upon the cup represent Industry in the fields and the workshop a[nd] Education; the three corresponding medallions represent Ceres, Vulcan, a[nd] Minerva; around the foot of the cup are grouped three figures representi[ng] the Fates. This work was designed by M. Dieterle, the bas-reliefs a[nd] figures round the foot by M. J. Feuchères, and the cup itself was produc[ed]

; the process of casting (*coulage*) by M. Greder—32*l*. A vase, egg shape,) inches high and 16 inches diameter, flowers painted on blue ground, by . Schilt—32*l*. A vase of antique form, decorated with flowers and buds, M. Schilt—24*l*. A pair of vases, blue ground, ornamented in Indian yle, executed by MM. Richard and Merigot, after the designs of M. Dieterle, inches high and 13 inches diameter—24*l*. A vase, 40 inches high and inches diameter, ornaments incrusted in coloured paste under the glaze 200*l*. A pair of vases, Chinese design, executed by casting (*coulage*), sea-een ground, flowers and birds modelled upon the ground in white and loured paste by Fischbag, after the processes invented by M. Louis obert, superintendent of the painting department at Sèvres, designed by Dieterle, 40 inches high and 19 inches diameter—112*l*. A vase of tique design, 32 inches high and 16 inches diameter, ornaments in gold a blue ground, by M. Frugenard. The manner of this painting is entially different from the usual painting on porcelain. The painting in is case has been executed on the unglazed porcelain, and the painted rface lies between the porcelain paste and the glaze. A pair of vases, 28 ches high and 15 inches diameter, landscapes representing the Seasons, mposed and executed by M. J. André, the ornaments by M. Barriat—216*l*. pair of vases, of new design, by M. Klagman, 24 inches high and 16 inches ameter, illustrative of agriculture; one of the principal bas reliefs, presents the horse, surrounded by allegorical figures representing force, iftness, courage, and beauty; the other represents oxen escorted by the ur Seasons; the lesser bas reliefs represent pastoral subjects. These vases re executed by the process of castings by M. Greder—80*l*. A pair of ses after the antique, 20 inches high and 10 inches diameter, executed M. Barriat after the designs of M. Hamon—72*l*. A pair of vases, called e Vases of Lesbos, decorated with figures, composed and executed by Roussel, ornaments in gold and colours, by M. Riton, after the designs M. Dieterle—168*l*. A pair of vases called the Rimini vases, 19 inches gh and 11 inches diameter, painted in blue, by M. F. Regnier, and orna-nted in gold by M. J. Richard—72*l*. A pair of similar vases representing overbs, composed and executed by M. Roussel, and decorated by M. chard after designs by M. Barriat—72*l*. A large cup of Chinese design, inches diameter and 24 inches high, sea-green ground, ornaments in ite and coloured paste, executed by M. Maserit after the designs of Dieterle—40*l*. A large cup, Chinese model, blue ground, handles and h mounting in bronze gilt, by Bouquet; the models of the mounting by Choiselet, after the designs of M. Dieterle—160*l*. A cup, after nvenuto Cellini, 16 inches high and 13 inches diameter, painted in blue Regnier—100*l*.

We give several engravings of Sèvres, Nymphenburg, and Meissen china, anches of manufacture particularly referred to in the preceding article. e also give a group of objects in stoneware, chiefly after classic or alham-aic models by Mansard, of Paris. These are productions of a genuine ass; and, although somewhat too gaudily coloured occasionally, are well apted for room decoration. The large vase in the centre is decorated th sacred subjects: the Saviour at the top seated, and the twelve Apostles compartments around.

THE GREAT EXHIBITION AWARDS.

Fourth Notice.

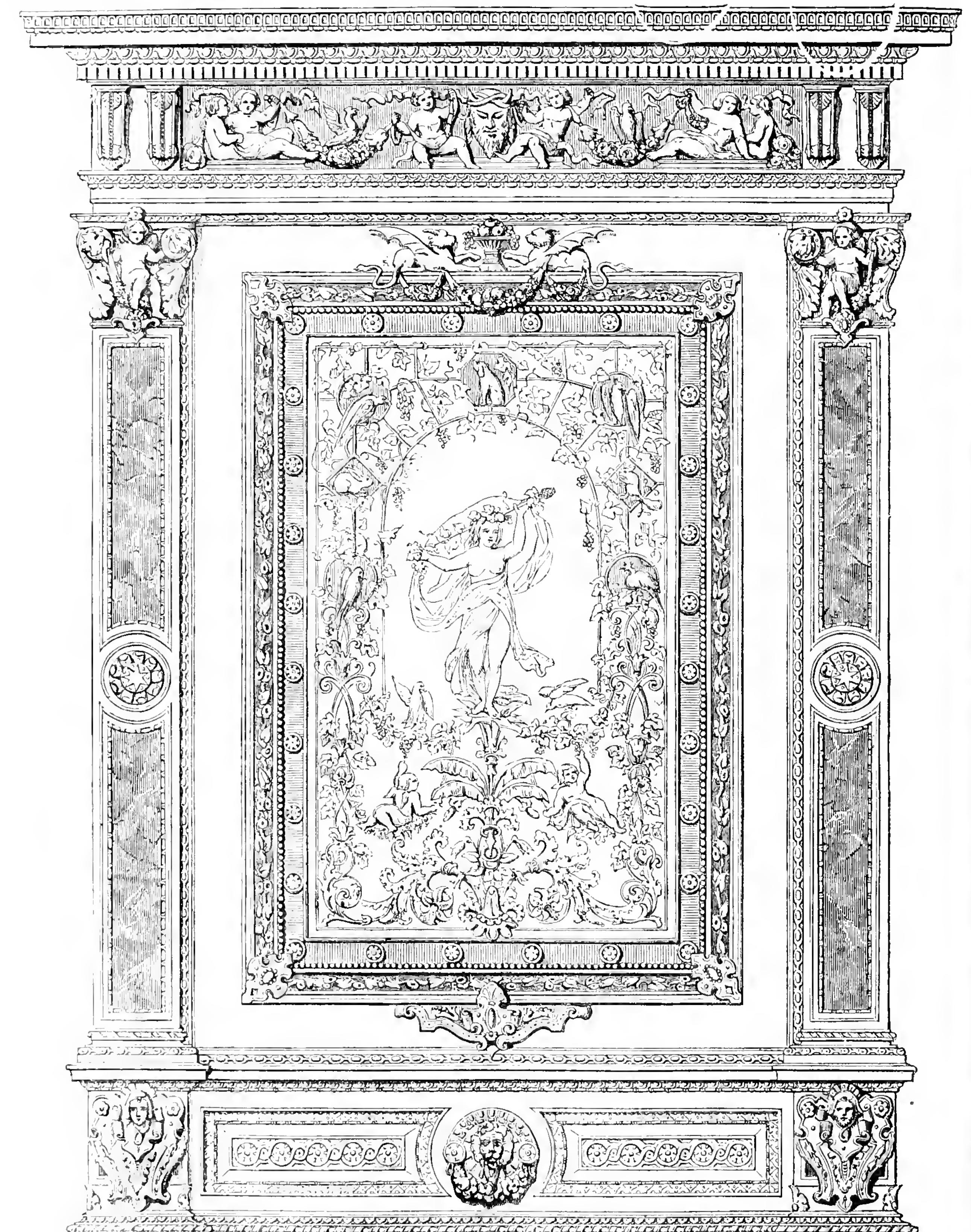
URSUING our observations upon the Great Industrial Gathering, and its recorded practical results, we open the list of awards at Class 8, Naval Architecture, military engineering, ordnance, armour, accoutre-ents," &c.; and here, of nine council medals, we find two only go to indi-duals—the one to Sir W. Snow Harris, "for his system of lightning con-ctors;" the other to the Duke of Northumberland, "for having caused a ge number of models of life-boats to be designed, with a view of obtaining e best form of boat for the preservation of life and property in case of ipwreck." Against the first of these awards we have nothing to say, nor uch against the other, for it provokes a smile which is more expressive an speech. That the Duke of Northumberland has done a very useful ece of service to the seafaring community, and especially to the hard-orking boatmen of our north-eastern coast, which bounds his Grace's pro-rty, by offering a prize for the best model of a life-boat, there can be no estion; no question he is entitled to the thanks of the public for the licitude manifested by him in a cause of general interest: but to pretend at, for so calling into competition the ingenuity of others to supply an knowledged desideratum, he should be considered to have a claim to share the highest honours in a great industrial and scientific congress, is not ly most absurd, but most contrary to the true principles of equity the commonwealth of intelligence. The anomaly is rendered the more aring by the very fact that Beeching, the inventor of the design which tained his Grace's prize of "100 guineas for the best life-boat," gets only ordinary second-class medal. This is putting the cart before the horse th a vengeance. So much for encouragement of individual merit. The her council medals in this class all go to public Government establish-ments, for the exhibition of [illegible] from the [illegible] respective departments. Thus, the Admiralty [illegible] rewarded for [illegible] charts and models of ships, the Geological Survey [illegible] geological surveys and maps of the United Kingdom;" the [illegible] partment, "for the illustrations of the great ordnance survey [illegible] Britain;" the Marine Department and the War Department of the [illegible] Government respectively have council medals for surveys and maps [illegible] France; and the *Ecole des Mines*, for the [illegible] map of France; [illegible] the Military Topographical Department of Austria are rewarded "for [illegible] surveys and detailed maps of the country around Vienna, and of [illegible] All these works are doubtless of considerable public interest, and [illegible] have been ably performed: but so ought all works to be [illegible] mand of the best talent of the country, together with [illegible] and other facilities. We will not trouble our readers [illegible] list of common medals scattered amongst the *οἱ πολλοί* in this class [illegible] cannot help, however, remarking that Colt's revolver, one of the most re-markable weapons of offence and defence which has been invented in our age, and which must prove of material importance to our colonial [illegible] when brought into general use, has been denied a medal: it has [illegible] over with "honourable mention."

In Class 9, the jurors, after a great deal of field-practice between [illegible] various competitors, have been as unfortunate as their fellows, having [illegible] satisfaction to nobody; whilst in the case of the only reaping machine honoured with a council medal, they have, upon proof well [illegible] selected that which was *not* the best, whilst the very best existing is not even "honourably mentioned." We have heard a good deal of the [illegible] and capricious manner in which, with all the pretended [illegible] the honours and rewards have been dispensed in this class. Many an exhibitor [illegible] covered, when too late, that his works had never been examined at all, whilst one more fortunate than the rest, who discovered [illegible] he had been so overlooked, and would probably be omitted altogether from the [illegible] managed to pin one of the jurors just in the nick of time, induced him to take a glimpse at his collection, and had his reward in Exhibition honours though the most important of his exhibits was not mentioned in the [illegible]

As for Class 10, with its *omnium gatherum* of musical and surgical instru-ments, of clocks and microscopes, and other philosophical apparatus, it has already come in for a pretty large share of our notice; and may, perhaps, as far as the clockmakers and pianoforte-makers are concerned, come under revision.

Considering that we are especially a manufacturing country, and that Manchester and Leeds are, as it were, the capitals of the manufacturing world (each in its department), and that Spitalfields in its own way is not unimportant—considering the ingenuity and the capital daily called into operation in devising and improving the wonderful machinery and processes by which our cottons, our woollens, and our silks are brought to perfection—considering, also, the linen manufactures and poplins of Ireland—we are certainly disappointed, upon looking over the awards in Classes 11 to 1[illegible] inclusive, to find that the whole of the wide field of industry comprised in them has not been considered entitled to a single council medal! In Class 19, "the Government Manufactory of Gobelins Tapestry" receives a council medal, for "extraordinary excellence of execution" in a peculiar and favoured branch of industry, which was brought to perfection long before our generation. In Class 25, the "Sèvres Porcelain Manufactory"—another Government corporation—is awarded a council medal for "high art," which had attained its height of perfection above a century ago, since which time a very beautiful colour, the *Rose du Barry*, has been lost, until now in course of revival by British manufacturers. Surely, if these honours were due to achievements of departed genius in France in articles of luxury, some testimonial to the historic and still active skill of Manchester in manufactures of essential utility might in some fashion, and under some pretence, have been accorded. But no—none of our great staple branches of industry are held worthy of "decoration" in the face of artistic Europe. There can be no doubt that the combination of "foreign interests" so inge-niously provided for by the regulations of the Commissioners, has led to this covert attack but too obviously contemplated in this supercilious ignoring of the industrial pretensions of a nation of "shopkeepers;" and the [illegible] becomes of still greater significance from the fact that the only council medal awarded to the whole range of textile manufactures is one, and that to a Frenchman (Class 15), for "the discovery of a new and important process in the production of elaborate designs." What this process of *producing* "designs" may be, we are at a loss at present to guess; perhaps the promised Reports of the Juries—which, we understand, already extend to eight or ten thousand folio pages—may one day enlighten us. Mean-while, sympathising with Manchester, Leeds, Paisley, Dublin, and Belfast, in their exclusion from the honours of 1851, we cannot but admire the tradesmanlike astuteness with which various woollens and cottons of sundry continental manufacturers are entered in the prize list with special additions of "lowness of price," "with relation to cost," &c.: a hint evidently bor-rowed from that great card at all ticketing shops, "Look at the price! Worth double the money!!" Our readers will bear in mind that the question of "prices" was one specially excluded in the original scheme of the Commissioners; a restriction honourably conformed to by British exhibitors, though unblushingly evaded by their foreign rivals.

We have not yet exhausted the subject; and shall return to it from time to time until we have done full justice, to the best of our judgment and ability, to all parties concerned in this great industrial scramble.—*Illus-trated London News.*



WALL DECORATION.—MORANT.

SEVERAL very ambitious designs for wall-decoration were displayed on the British side of the Crystal Great Exhibition, which will be considered at some length in subsequent articles on "Decorative Art." Mr. Morant's design is very elaborate and showy, combining colours and sculpture-work in great profusion. The style would pretend to be tha Louis Quatorze, but for the introduction of rabbits, spaniels, &c., wh savour more of *rococo*. The principal object is a female figure, of Bacchanal family, standing in the midst of a sort of trellis-work frame, w

C|ids, birds, dogs, &c., i| compartments. This i|nclosed within an ar- e|ectural composition o|marble pilasters, sur- m|nted by a rich frieze. T| capitals of the pilas- t| present Cupids in w|te enamel peeping f|n a richly gilt foliage.

VICTORY.—G. NELSON.

THIS is a piece of sculp- t| in marble intended t|commemorate the ser- v|s and memories of the o|ers and men of the 5|h Regiment who fell o|he banks of the Sut- l| It is of the tomb- st|e order of art, and as s|h, may pass without r|oach; but for any h|her claims to notice w| cannot admit them.

VICTORY.—G. NELSON.

ANDROMEDA.—J. BELL.

THIS is certainly one of the most graceful of Mr. Bell's numerous productions, and it has be| most satisfactorily cast by the Colebrook Dale Company. Descending to de|ils, we may object with justice to the elaborate treatment of the chain, and to its re| artificial disposition. It must be obvious, that such a chain, so disposed, could no| have been attempted in marble or plaster; and the pains bestowed upon it, and th| ostentatious manner in which it is displayed, the material happening to be m|l, betrays an error in judgment. There is no honour in producing in bronze an ar|lo which any manufacturer of hardware could make by the dozen; the chain in|lent should therefore have been neglected, or treated conventionally, as almost be|ath the attention of the artist, instead of being seized upon and made the most of|s has been evidently the case. Since its location in the Crystal Palace this work h| been purchased by her Majesty.

ANDROMEDA.—J. BELL.

LIBERATION OF CARACTACUS.

BY PANORMO.

THIS, though somewhat roughly modelled, was one of the most expressive and well-studied pieces of sculpture in the British Exhibition. It is by a young artist of the name of Panormo, a student of the Royal Irish Academy. The incident represented is well known to all readers of our country's history. Caractacus, after nine years unequal combat with the Romans, is subdued and taken captive, along with others, to Rome. Whilst being paraded through the magnificent streets of that city, he exclaims, in a tone of sublime melancholy, "How is it possible that a people who are possessed of such magnificence at home, should envy me a poor cottage in Britain!" The Emperor Claudius was so affected by the homely truth of these few words, which he overheard, and the noble and interesting bearing of his royal captive, that he immediately ordered him to be set at liberty, together with the rest of the prisoners.

LIBERATION OF CARACTACUS.

AGRICULTURAL IMPLEMENTS.

PLOUGHS—ANCIENT AND MODERN.

THERE were few compartments in the Exhibition which illustrated in a more striking manner its great end and aim—that of showing the point of development which the nations of the world have reached in the great task of subduing nature to their use—than that devoted to the display of agricultural implements. Who is there that has traversed the spacious area occupied by these articles, who has not felt that here was indeed a remarkable subjection of the products of the mineral world, for the purpose of subduing the earth itself, and of causing it to bring forth its harvests with abundance? Passing from this area, filled with the results of human ingenuity and the skill of the mechanician and engineer, to the compartment of India and other less favoured countries, contrasting their rude implements of husbandry with our own—perhaps in no department of the Exhibition could a more striking lesson have been conveyed, or the progress of the human race more completely demonstrated.

In the Indian compartment were to be seen models of the old plough, fashioned in the same rude manner as it was centuries since, with the driver standing upon the framework: the oxen yoked in the same ancient style as when Elisha was seen "ploughing with twelve yoke of oxen," or as when, in the time of Samuel, "an half acre" was considered as much as a pair of oxen could plough in a day. There also was the model of a squalid and wretched-looking sower scattering and wasting the seed; another in which the hoofs of oxen tread out the grain after the same fashion as existed centuries ago—while in this country the steam-engine, improved drills, horse hoes, and thrashing machines perform the work thus badly and tardily accomplished by the Indian peasant. The Exhibition showed that, in matters of husbandry, the vast majority of the natives of our Indian empire are stationary, while Great Britain and the United States of America, on the other hand, indicate the most striking improvement in this respect. The same remark applies, but in a more qualified manner, to most of the Continental States of Europe; they have advanced beyond the rude and earlier stages, but it is not too much to say, judging from their display at the Exhibition, that they are still much in arrear.

There is probably no implement which has received a greater amount of attention on the part of the implement-makers of this country than the plough. During the last twenty or thirty years the improvements which have taken place have been of the most extensive and practical character—a circumstance which is no doubt mainly attributable to the impulse which has been given by the practical tests to which they have been frequently subjected before practical judges, for the purpose of ascertaining which peculiar construction of plough did its work in the best manner, and at the least expenditure of labour and money. To the solution of these questions the most eminent agricultural engineers have devoted their time and attention, and, as the display of this kind of instruments proves, with very great success. The best display of ploughs in the British department was, undoubtedly, that of the Messrs. Howard, of Bedford.

The new "patent plough," made of wrought iron, we engraved and described in our first number, page 13, to which therefore we refer the reader.

A patent iron Kent plough, brought out by the assistance of Mr. Russell, of Farningham, Kent, is intended as a substitute for the large four-horse Kentish plough; it is fitted with mould-boards, or breasts, which turn the furrow over "round," leaving a perfect "seam," in the same manner as the Kentish "turn-wrist plough." It may be used with a pair of horses—is suitable almost for any land—and is held in high esteem in many parts of Kent and Surrey.

The well-known firm of Messrs. Ransome and May, of Ipswich, contributed some very excellent specimens of their manufacture. A plough for two-horse draught, marked Y L, in their catalogue, is especially deserving of notice. At the trial at Southampton it was shown that, by simply changing the "mould board," it will answer equally well for heavy or for light land, and upon that occasion it obtained the double prize of the Royal Agricultural Society. Its construction is exceedingly simple, and its draught light. In its original form it was first introduced by Mr. Richard Baker, into Rutland, and was very generally used there, and is now known as the Improved Rutland Plough, Y L. The new patent wrought iron plough, marked Y F L., suited for two or four horses, is well adapted for emigrants, as, by an easy arrangement, the handles can be taken off and secured to the beam, thus reducing the measurement. Several other ploughs exhibited are also of a character to sustain the well-known reputation of this eminent firm, and many of them have obtained premiums at the meetings of the Royal Agricultural Society in various parts of the country.

Mr. Bentall, of the Heybridge Foundry, Maldon, Essex, exhibited a patent broad share and subsoil plough, which appears admirably calculated to supersede many of the older, more costly, and cumbrous implements. Messrs. Barrett and Exall showed several very excellent specimens; their "Universal Plough" is deserving of special notice, on account of its usefulness and economy. Messrs Hensman and Sons showed their well-known patent iron plough with patent coulter fixing, and also an iron plough f deep work, fitted with high wheels and deep-turn furrows, which adap for ploughing 16 inches deep. Messrs. Wilkie and Co. had a good collect of "turn-wrists," two-horse sowing ploughs, subsoil, and anti-friction ploug Among other exhibitors of this implement which we noticed are Mr. Pear of Dorsetshire; Mr. Law, of Shettleston, near Glasgow; Messrs. Duf and Co., of Red Lion-square, who showed a very creditable and use subsoil plough; and Mr. Stuart, of Aberdeen, who exhibited a sub plough. Messrs. Sewell and Co., of Longtown, Cumberland, showed well-known Netherby plough, which may be described as well adapted cutting, and leaving in proper position furrows of any required width u any variety of soil.

A medal has been awarded to Mr. Busby, of Newton-le-Willows, n Bedale, Yorkshire, for the best plough exhibited at the Great Exhibitio 1851. Its chief peculiarity is in the scientific form and great length of mould-board, which turns the seam in a better manner and with a ligl draught than any other. It is also fitted with a moveable nose-piece, which the share is placed, and which will be found of great advan where cast-iron shares are used; for, as these wear down, by this arra ment the plough still retains the same hold of the ground; by the s contrivance, also, the share may be set more or less to land, and it work from four to eight inches deep.

In the Zollverein, Dr. C. Sprengel and M. H. Hartmann exhibited models of implements used in German agriculture, several of which v novel in character. Among them were the model of a plough with sixt shares; a subsoil plough, adapted for ploughing from 18 to 22 inche Pomeranian fan plough, and a Belgian plough. The Belgian plou displayed appeared somewhat heavy; they are strongly and stoutly m but show a want of finish. Several ploughs were shown in the Aust department, from the manufactory of agricultural implements of Pr F. von Lobkowitz, stated to be the inventions of the Chevalier von Int the manager of the works; many parts of the implements appeared c to grave objections, while, in several instances, undoubted improvem might be pointed out. However, as a whole, they do not tend to conv very good opinion of the state of agricultural mechanism in Austria.

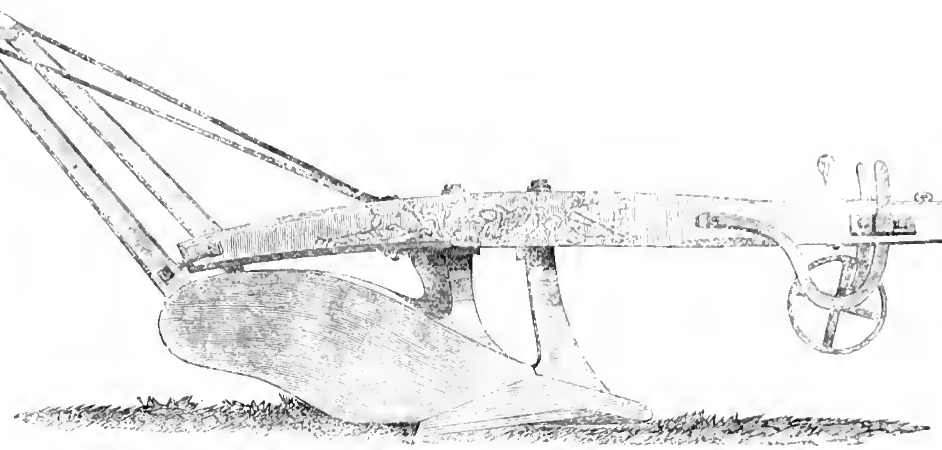
On the foreign side, the department which made the best show of plou was that occupied by the United States; and the implements exhib possessed many strong points of contrast, even with the English plou and with all others, in fact, that were put forward for competition. Witl entering into the question of the comparative merit of European Amerian ploughs, the satisfactory solution of which is to be found in ac use only, we will briefly describe those which have been furnished Boston and New York exhibitors—these two sections having made mainly the agricultural portion of the United States division of Exhibition.

These ploughs are made from patterns of peculiar construction, and of great variety in size, form, fixture, and adaptation to different condit of soil and modes of culture. The wood part of these implements i most cases, made by machinery, and can be readily taken apart for rep or put up for conveyance to distant parts. The timber is, in nearl cases, a second-growth white oak, of peculiar toughness. The iron use composed of an admixture of several kinds, producing a metal of gre strength and durability than the ordinary iron, and which will endure chilling process, applied to the point of the share and the base of landside, with safety. The mould-board, landside, and point of som these ploughs are ground and polished, and coated with blue varnis making them resemble blue steel—to prevent rusting. They are better fitted for adhesive soils by this process, the dirt being preve from sticking upon them, and impeding their progress.

Among the ploughs exhibited were the root-breaker, sward, stub centre-draught, corn, double mould board, ditching, side-hill, &c. &c. T were of various sizes, and calculated for all kinds of soils. Some are tended to have the common, some the Scotch clevis; some have draught-rod, and others the crane clevis attached, so that the team walk on the sward instead of a wet furrow, or so that the ploughs can close by the side of a fence or ditch. The advantages claimed for man these ploughs are, that they are smoother and better made, and more dur and cheaper than the common plough in use; that they work much m effectually, cutting a deeper, wider, more even, and truer furrow; and t they will do their work with less expenditure of team power. They also pulverise the earth as they lift and turn it over, thus effecting t minute and general separation of the particles of the soil which is so essen in preparing it for the ready admission of the rootlets of the plants, enabling them to draw their food from every portion of it.

One principle, alluded to above, in these ploughs, is too important to passed lightly over. From the complicated structure of the plough, the manner in which the draught must be applied to it, many miscon tions have arisen as to the true operation and proper application of t draught. Too little is understood of the principle involved in this to ena the ploughman to attach his team and arrange his clevis so that the inst ment shall do its work with the least force of power. The draught is the end in view, but merely the means by which the end is accomplishe the former being made to subserve the latter; so that if it be not righ applied, good work cannot easily be done. If, for example, the plou inclines out of the ground too much, or takes too wide or too narro furrow slice—both evils usually arising from a wrong application of draught—the ploughman must exert a force to direct it properly, in addit

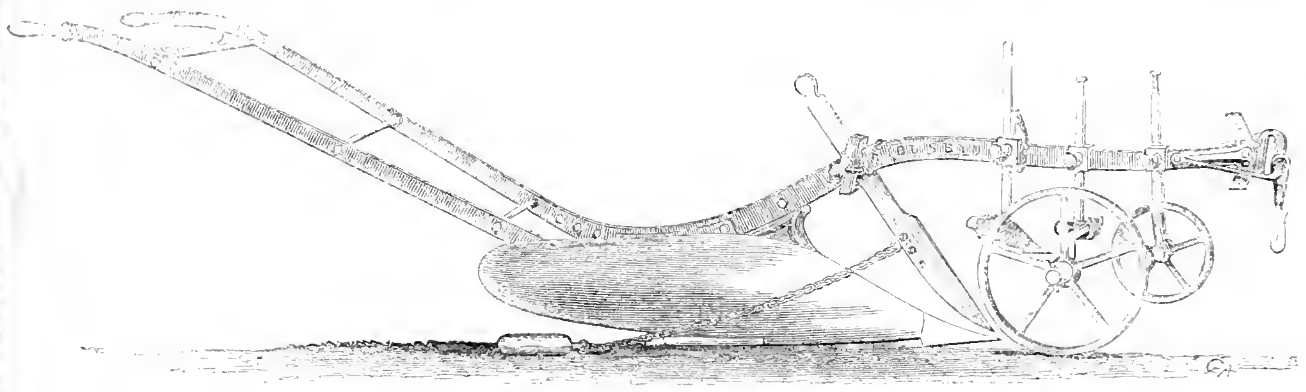
that which is required to overcome the inequalities of the soil; while, o the contrary, if the draught be rightly applied, the plough will move accurately as not only to perform good work with more ease to both ughman and team, but, in soil free from obstruction, even without being led. This application of the draught to the plough is claimed to be superior in the American plough to that in any others. The claim of superiority can be easily tested by the application of the dynamometer, an instrument made for measuring the exact amount of power employed; and we understand that the exhibitors are willing for a trial of competition whenever this shall be allowed as one of the elements of excellence. In a



AMERICAN STARBUCK PLOUGH.

nt and carefully conducted trial in Massachusetts, upon the merits of ghs, it was found that a difference of power, even between the best and t modern inventions, existed to the extent of more than one sixth—that s 412lb. to 506lb.

e American side-hill, or "Starbuck" ploughs, we understand, are being used here with much acceptance. They are so constructed that the mould-board can be instantly changed from one side to the other, which enables the ploughman to perform the work horizontally upon side hills, going back and forth on the same side, and turning all the furrow-slices with great accuracy downwards. They are employed also for level ploughing.



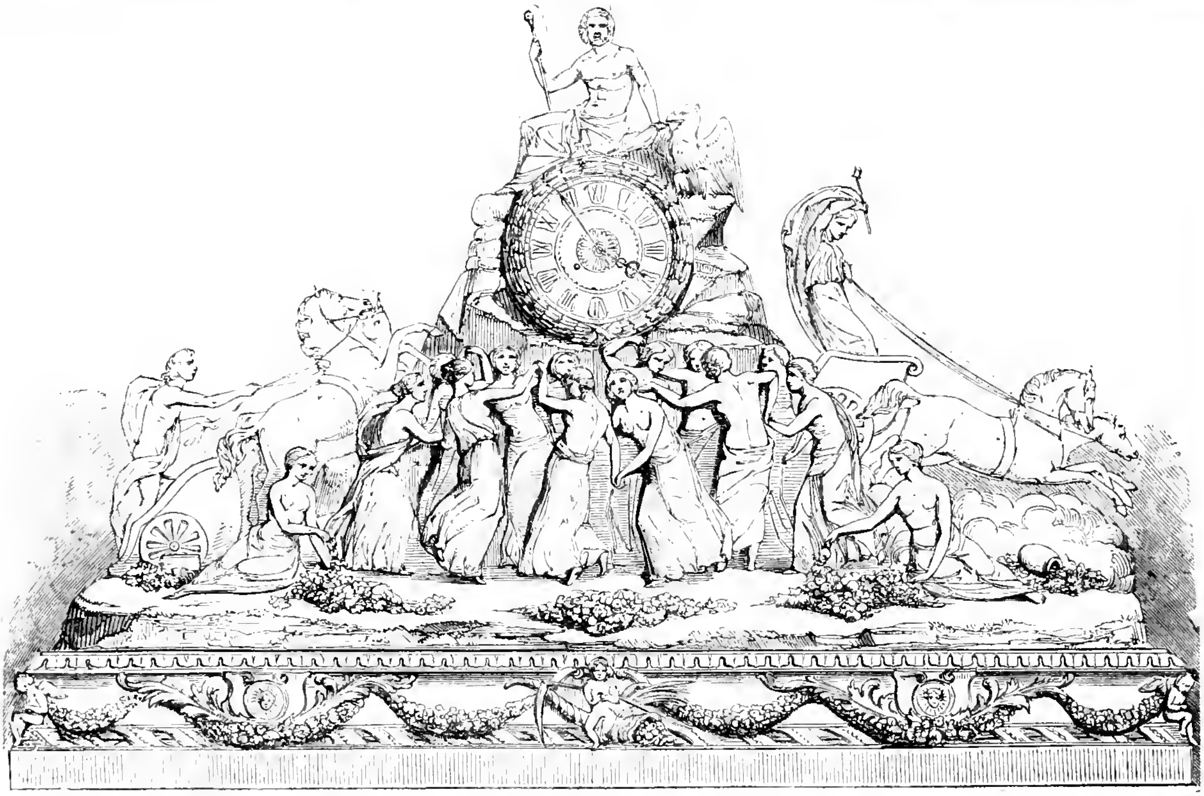
BUSBY'S PATENT PRIZE PLOUGH.

he work leaves the field without any centre-dead or finishing furrow, without the banks or ridges of turning two furrows towards each other. y also save labour, by allowing the team to turn short about at the end he furrow, instead of obliging it to travel across the wide ends of each in the field. For ploughing down the banks of ditches they are the plough which will turn the furrows from the ditch, thus carrying the h upon the level ground. (See Engraving).

Although the number of each kind of agricultural implement exhibited from the United States was small, the variety was very considerable. The remaining specimens included harrows, rakes, hoes, potato-hooks, (a good invention to save the potatoe from injury in uncovering the soil), scythes, forks, shovels, spades, farming mills (one, especially, of a new and valuable kind), grain reapers, mowing machines, seed-sowers, axes, &c.

DORNO'S CIGARETTE MACHINE.—This machine consists of two travelling ns, whose parts are made with great accuracy. Each link is composed velve pieces, which are cut out of iron by machinery. One portion of link is fixed on the chain, and the other portion is moveable. By teen separate and distinct operations this machine makes and finishes cigarettes with greater neatness and perfection than can be done by d; and the economy of tobacco is so great, that, solely in this respect, price of the entire manufacture by hand labour is wholly saved. More eighty cigarettes may be made by this machine in a minute. Paper of proper width and thickness is caused to pass over one of the travelling s, consisting of links corresponding with the scantling of the cigarette. n the paper has a sufficient number of indents, fine tobacco is put into by the machine, and the waste falls into a trough beneath the hine. As the chain on which the paper is first placed moves forward, a e, by means of a reciprocating motion across the machine, separates the r to form the cigarettes, which are finally folded entire, by passing to the r travelling chain; and by pressure from above the cigarettes are com-ed ready to be removed from the machine. In the English market there rcely any demand for cigarettes, but in Spain and the American repub-there is a great consumption of them. In Mexico, 8,000,000 dollars h of cigarettes are consumed in the course of a single year. The con-tion of cigarettes in Spain and Havannah is proportionably greater.

MODEL OF PRINCE ALBERT'S BIRTHPLACE.—The *tableau* of plastic work, extending about 18 feet in front, and 10 feet wide, and representing a rural *fête* at a suburban *château* belonging to the Duke of Saxe Coburg Gotha, the birthplace of Prince Albert, and the residence of her Majesty the Queen Victoria when on her visit to the Duke, exhibited at the Crystal Palace, in the Prussian department, was sold by auction in Leadenhall street, by order of the Zollverein committee. The *tableau*, which will be well remembered, contains about four hundred moveable figures grouped in dances, bands of music, and festive parties, all set in motion by much complicated machinery, the cost in the construction, as authoritatively asserted, being more than 800*l.*, subscribed by an association of manufacturers at Sonnenberg, Duchy of Saxe Coburg Gotha. The object, it is stated, was to present it to Prince Albert, who, however, declined it, but proffered to purchase it on a price being named. From some cause not explained, the model *fête* remained with the Zollverein committee, who, since the closing of the Great Exhibition, obtained its passing the Customs at the low estimate of 7*l.* 1*s.* At the sale, on the 28th ult., it was sold for the comparatively trifling sum of 26*l.*—*Illustrated London News.*



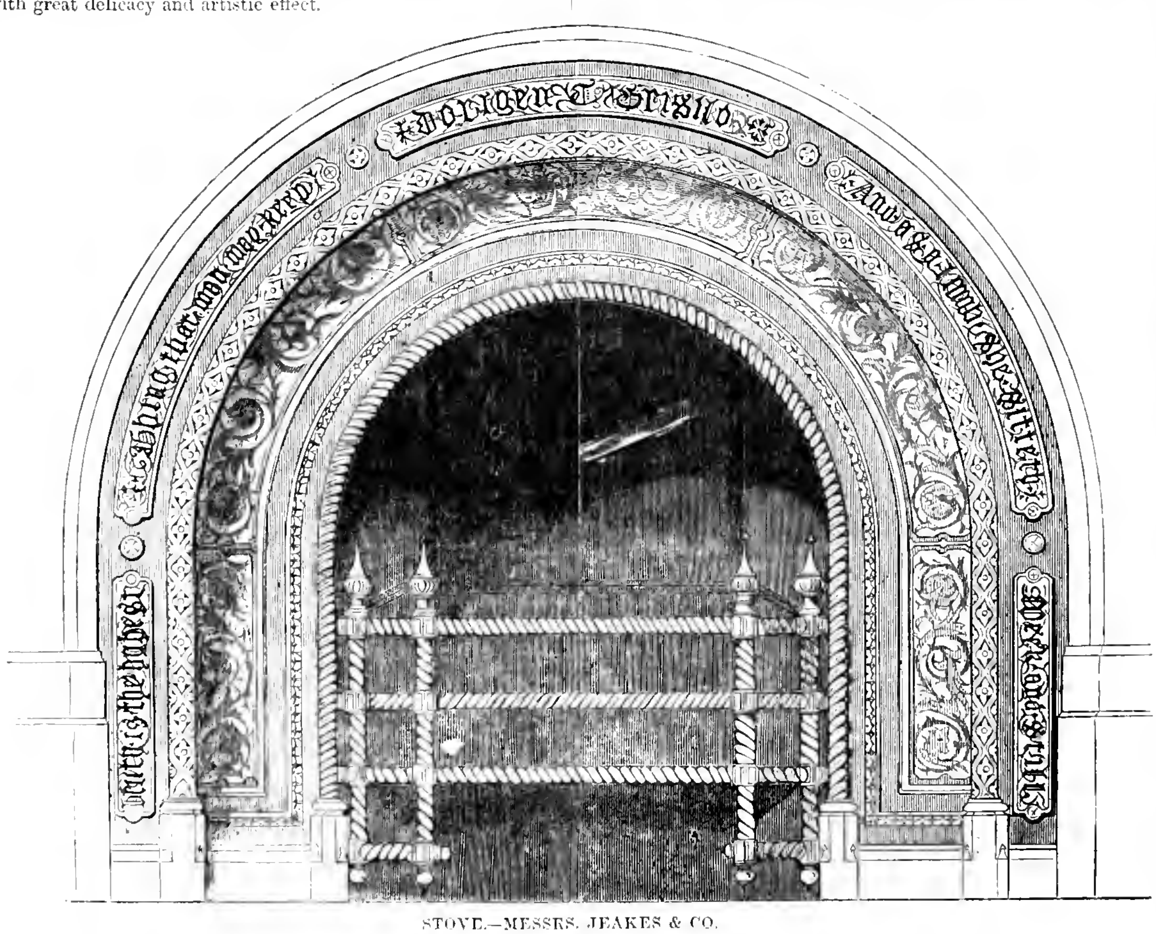
OR-MOLU CLOCK.—HOWELL & JAMES.

OR-MOLU CLOCK.—BY HOWELL AND JAMES.

Amongst the magnificent display of jewellery and decoration articles by Messrs. Howell and James, was a clock, which we engrave, after an exquisite design by Mr. Adams. It represents the Hours dancing round Mount Olympus, the Seasons scattering fruits and flowers, &c. The whole is finished with great delicacy and artistic effect.

STOVE.—BY JEAKES AND CO.

This stove is one of the most chaste and novel which has appear for a long time. It is Elizabethan in design, and the execution is a gorgeously ornamental character, though not beyond the bounds of go keeping. The material is polished steel, inlaid with ornaments in gold.



STOVE.—MESSRS. JEAKES & CO.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

GOTHIC BOOKCASE.—LEISTLER.—PRESENTED TO THE QUEEN BY THE EMPEROR OF AUSTRIA.—SEE PAGE 183.)

TEXTILE MANUFACTURES.

WEAVING.

IN our first article on cotton manufactures are described the various processes by which cotton wool is brought into the shape of thread fit for weaving and other purposes : we now proceed to give a general description of the machinery employed in weaving it into cotton-cloth or calico. Although we have taken cotton as the most important of our great textile manufactures, as the illustration of these processes, they apply with more or less of variation to silk, wool and even flax. The peculiarities in the manufactures of these articles will be treated of subsequently under their several heads.

The act of weaving is of very ancient date : it is attributed to the Egyptians ; but it has received great and important improvement in modern times, more particularly in the application of water-power, or steam, in place of hand labour.

Woven textures derive their strength from the same force of lateral adhesion, which retains the twisted fibres of each thread in their situations. The manner in which these textures are formed is readily understood. On inspecting a piece of plain cloth, it is found to consist of two distinct sets of threads, running perpendicularly to each other. Of these, the *longitudinal* threads constitute the *warp*, while the *transverse* threads are called the *weft* or *woof*, and consist of a single thread, passing backwards and forwards.

As the threads which constitute the warp are liable to much friction in the process of weaving, they are subjected to an operation called *dressing*, the object of which is to increase their strength and smoothness, by agglutinating their fibres together. To this end they are pressed between rollers, impregnated with mucilage made of starch, or some gelatinous material, and immediately afterwards brought in contact with brushes, which pass repeatedly over them, so as to lay down the fibres in one direction, and remove the superfluous mucilage from them. They are then dried by a series of revolving fans, or by steam cylinders, and are ready for the loom.

In weaving with the common loom, the warp is wound upon a cylindrical beam or roller. From this the thread passes through a *harness*, composed of moveable parts, called the *heddles*, of which there are two or more, consisting of a series of vertical strings, connected to frames, and having *loops*, through which the *warp* passes.

When the heddles consist of more than one set of strings, the sets are called *leaves*. Each of these heddles receives its portion of the alternate threads of the warp, so that, when they are moved reciprocally up and down, the relative position of the alternate thread of the warp is reversed.

Each time that the warp is opened by the separating of its alternate threads, a *shuttle*, containing the woof, is thrown across it, and the thread or woof is immediately driven into its place by a frame called a *lay*, furnished with thin reeds or wires, placed among the warp, like the teeth of a comb. The woven piece, as fast as it is completed, is wound up on a second beam, opposite to the first.

In plain weaving, every thread of the warp crosses at every thread of the woof, and *vice versâ*. But, in articles which are *twilled*, or *tweeled*, this is not the case; for, in this manufacture, only the third, fourth, fifth, sixth, &c., threads cross each other to form the texture. In the coarsest kinds, every third thread is crossed; but, in finer fabrics, the intervals are less frequent, and, in some very fine twilled silks, the crossing does not take place till the sixteenth interval.

A loom, invented in the United States, has been applied to the weaving of twilled goods by water-power. Jeans, dimities, serges, &c. are specimens.

In double weaving, the fabric is composed of two webs, each of which consists of a separate warp, and a separate woof. The two, however, are interwoven at intervals, so as to produce various figures. The junction of the two webs is formed by passing them at intervals, through each other, so that each particular part of both is sometimes above and sometimes below. When different colours are employed, as in carpeting, the figure is the same on both sides, but the colour is reversed. The weaving of double cloths is commonly performed by a complicated machine, called a *draw-loom*, in which the weaver, aided by an assistant, or by machinery, has the command of each particular thread by its number. He works by a pattern, in which the figure before him is traced in squares, agreeably to which the threads to be moved are selected and raised before each insertion of the woof. Kidderminister carpets and Marseilles quilts are specimens.

Cross Weaving.—This method is used to produce the lightest fabrics, as gauze, netting, catgut, &c. In the kinds of weaving which have been previously described, the threads of the warp always remain parallel to each other, or without crossing. But, in gauze-weaving the two threads of warp which pass between the same splits of the reed, are crossed over each other, and partially twisted, like a cord, at every stroke of the loom. They are, however, twisted to the right and left alternately, and each shot, or insertion of the woof, preserves the twist which the warp has received. A great variety of fanciful textures are produced by variations.

Pattern Weaving.—Having thus given our readers an account of the loom for plain weaving, we must briefly notice the fanciful and ornamental part of the business. Figures, or patterns, are produced in the loom by employing threads of different colours either in the warp or weft. By the proper use of these, some colours may be concealed, or kept back, whilst others are thrown into the front of the fabric. These are made to change places at the will of the weaver, or, as in the case of the Jacquard loom, by the agency of machinery. In other cases, the same end is accomplished by employing two or three shuttles, with different coloured threads, either of which may be introduced at pleasure. These processes will be more particularly explained when we come to describe the machinery actually exhibited.

Power Weaving.—In 1678, M. de Gennes invented a rude kind of weaving machine, intended to increase the power of the ordinary looms; and other looms were invented, which were intended to be worked by a winch, by water power, or by some contrivance more expeditious than the common hand weaving. But the most important step in advance was made by the Rev. Edmund Cartwright, in the invention of the power loom, in 1785. He took out patents for successive improvements in it in 1786, 1787, and 1788. He had, in the mean time, established at Doncaster, in Yorkshire, a considerable manufactory, worked by a steam-engine, where muslins, calicoes, &c., were fabricated by this machine, very little, if at all, inferior to those woven by hand.

In the year 1791 or 1792, a person of the name of Grimshaw made an attempt to introduce Mr. Cartwright's looms at Manchester. He built a manufactory on a large scale, and several of the looms were actually erected, ready for working, when the whole establishment was destroyed by fire. As there was reason to suspect that this was not done by accident, no other manufacturer chose, at that time, to render himself obnoxious by introducing the use of machinery; and Mr. Cartwright's attention being directed to other inventions, from which he expected to derive greater advantage, his machine for weaving remained for some years nearly as much disregarded by himself as it appeared to be neglected by the public.

The great advantages necessarily resulting from this species of loom ultimately induced several manufacturers to attempt modifications of the apparatus, so that its use has now become one of the chief features in our largest manufacturing establishments.

In the manual operation of weaving by the ordinary hand-loom, the workman swings the vibrating batten to and fro for the purpose of enabling him to form a close and perfect texture of the woven fabric. This process is readily effected by machinery, and when so arranged it is called the power loom.

COTTON MACHINES.

We have already described (p. 71—2) the extensive plant of cotton machines for carding and spinning, exhibited by Messrs. Hibbert and Platt. The next cotton machines that we came to were those contributed by Messrs. Parr, Curtis, and Madeley, of Manchester. The first of these was a carding engine, with the patent coiling motion of Messrs. Tatham and Cheetham. This machine, however, was not in movement. The next machine sent by this firm is a drawing frame of three heads, with the patent coiling motion—here shown in action—and the patent stop motion of Aitkens and Holdsworth. This latter is of great importance, for by it is attained the certainty of stopping the machine when one of the slivers breaks; and this stoppage prevents what are called "singles" in the roving—that is, single instead of compound threads. That is effected as follows:—When the sliver is drawn along by the drawing-rollers, it passes under a small brass fork and keeps it up; but when the sliver breaks, it lets the fork fall into a notch in the bar below, which is always in motion endwise, and holds it fast, and by a connexion with the strap, throws the machine out of gear.

The slubbing-frame comes next, and contains some improvements patented by this firm. One of these is the application of a coiled spring to the presser, and is considered to be a great improvement on the common spring, as it allows the weight of the flyer to be reduced. A large proportion of the trade use this, by licence of the patentees. Another improvement is the application of a frame fastened to the beam for supporting the carriage which carries the tension weight of the cone strap instead of letting it rest on the grooved shaft, as is usual. Gearing is also applied to the shortening and traverse motions.

The roving-frame, which we observe next in order, has the same patented improvements as those applied to the slubbing-frame, and, in addition, has wheels made of gutta percha, as an experiment—which certainly are almost noiseless, as compared with the usual iron wheels.

The self-acting mules next claim our notice, and contain several improvements, patented by this firm. Three different headstocks are exhibited in the three mules, to show the arrangements of these improvements.

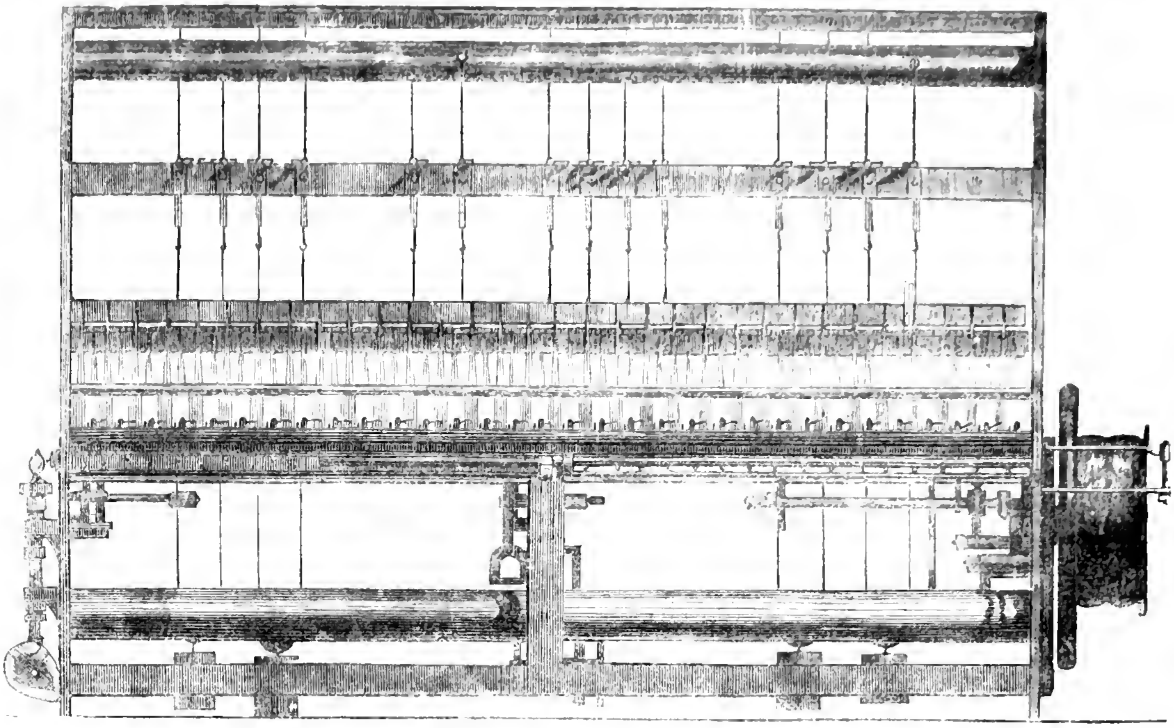
In the first or twist mule, made on Sharp and Roberts's plan, instead of the usual cone shaft, put in motion by friction, for producing the changes required for spinning, a catch-box, with an eccentric boss, is used, as more certain in its operation, being less liable to break the bands and injure the machine. Another improvement is the position and application of two scrolls instead of one. These prevent the cords from chafing and rubbing against each other, and render them more durable than when one scroll only is used. The arrangement of the faller motion is the next improvement, and here the fallers are made to act more easily upon the yarn, so that when the backing takes place, no recoil ensues, as is often the case when the cone shaft is applied; and thus snarls and damage of the yarn are obviated. A spiral spring is applied to bring the conical disc in contact with the backing-off wheel which renders the backing-off capable of great nicety. The squaring shaft is also driven by gearings instead of bands, as previously used in self-acting mules. The general arrangement of the headstock is much lower than usual—which makes it steadier, and, by obstructing the light less, enables the spinner to see all the spindles from any part of the machine. There are 456 spindles in this mule.

The next mule, of 500 spindles for weft, is arranged on the principle known as Smith's. The mangle wheel and stripping motion are here used, but the winding on is done by the radial arm, and the rollers are worked independently of the mangle wheel. This allows the rollers to be put in motion when desirable, or to be stopped at pleasure. One strap only is used, instead of two, as in Smith's, and one mule.

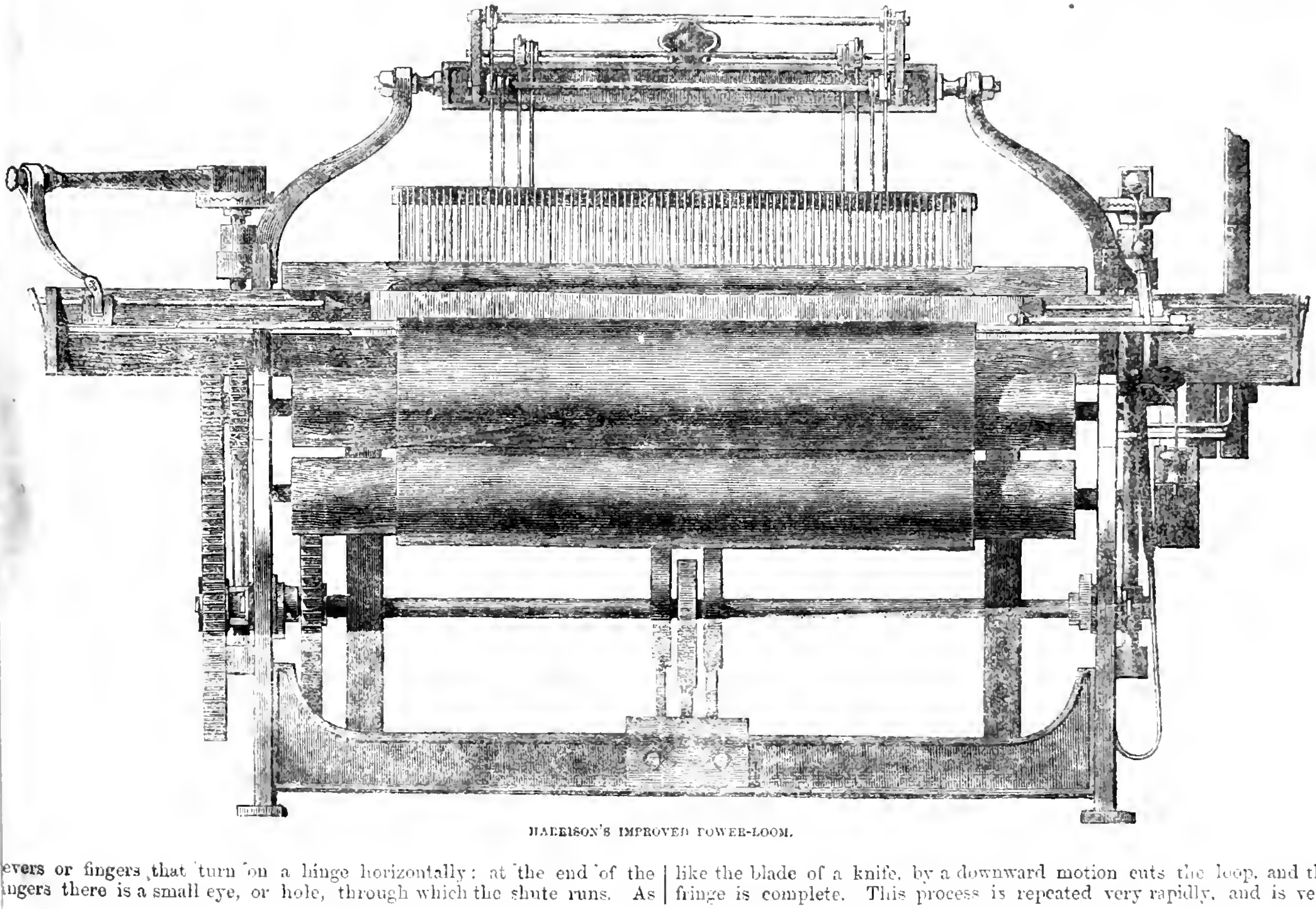
The third mule contains other improvements, as follows:—A double cone-expanding motion for winding on the yarn; a self-regulator which varies its form to suit the figure and size of the cop, and thus regulates the winding on itself independently of the spinner, who need only be able to piece the ends, instead of being a skilled operative at high wages. This is a great object where experienced workmen are scarce. This mule has 28[illegible] spindles, but many mules on this plan have 800. More than 500 old mules have been altered to this plan, and 100 new ones have been made.

REED'S PATENT SHUTTLELESS POWER-LOOM.

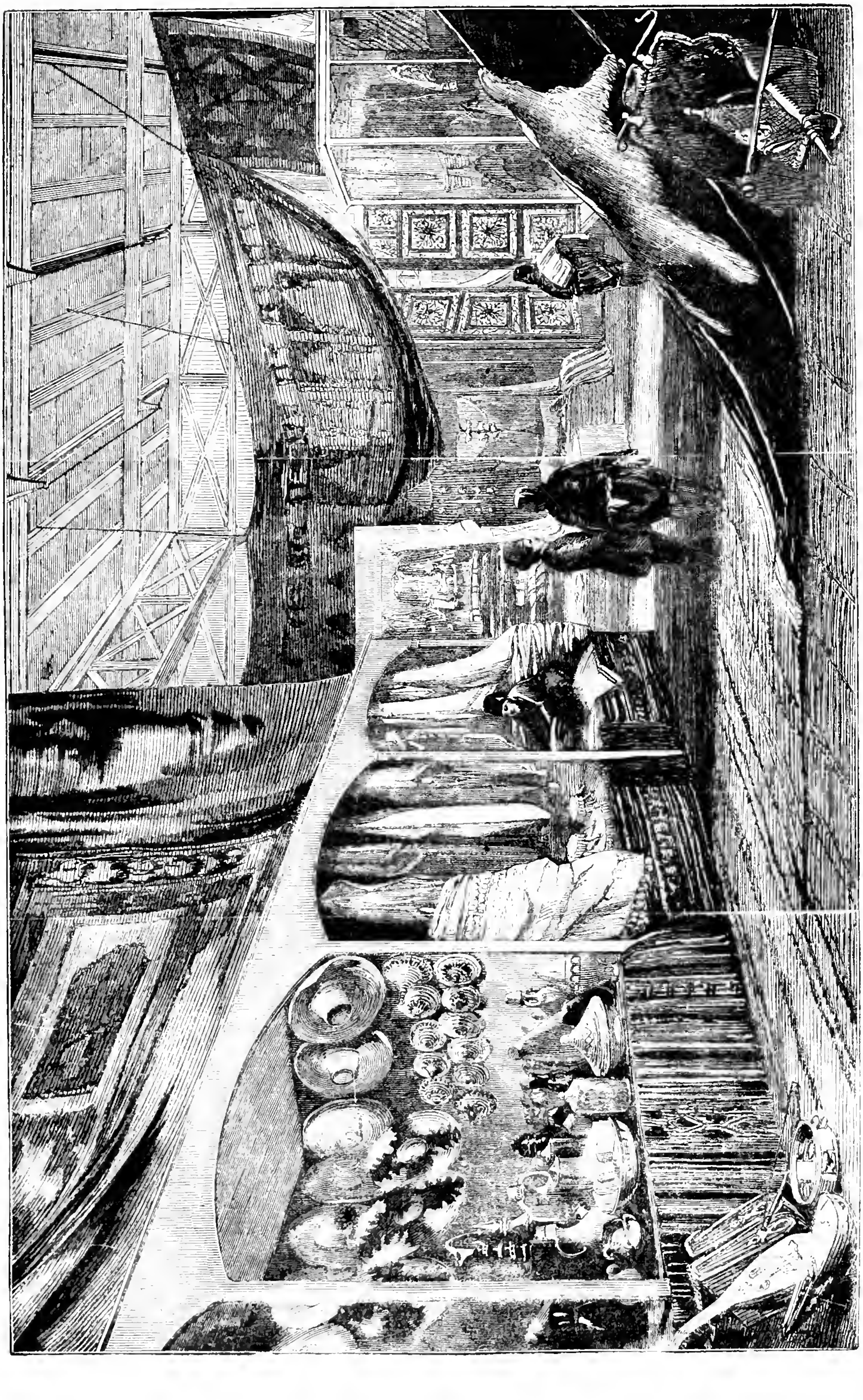
The ordinary loom for weaving ribbons and other narrow fabrics requires, for the perfect play of the shuttle, a space three or four times greater than is occupied by the web. In all looms hitherto constructed, the shuttle has been an indispensable necessity. To overcome this, and economise space, and, consequently, greatly to reduce the cost of production, has been the aim of the invention of T. S. Reed and Co., of Derby, the patentees of the loom we are now describing. The principle is original, yet simple, and may introduce many improvements in the art of weaving. The loom is now filled with a fringe about 2½ inches wide, of which it produces 34 breadths at once, while the ordinary loom with the same length of beam, could not produce more than thirteen or fourteen breadths. Under the beam there runs a cam shaft, giving motion to the various parts of the loom. Attached to the breast beam there are levers or fingers that turn on a hinge horizontally: at the end of the fingers there is a small eye, or hole, through which the shute runs. As the warp opens to receive the shute, the finger moves and carries the thread across. At the same instant a needle rises and catches the loop of the returning thread, and holds it tight until the finger has returned and the batten advanced, when another change in the warp thread takes place; then the needle, which is flattened at the upper part and sharpened like the blade of a knife, by a downward motion cuts the loop, and the fringe is complete. This process is repeated very rapidly, and is very



REED'S PATENT SHUTTLELESS LOOM.



HARRISON'S IMPROVED POWER-LOOM.



THE TUNIS COURT—INTERIOR. (SEE PAGE 183.)

interesting. In addition to the economy of space, it is clear, that where there are no shuttles there are no pirns or quills to fill, and no stoppage of machinery while the change of quill is being made. The silk, being wound on large bobbins behind the harness, is supplied with facility, and when the loom is once started, it need not stop until the warp is finished.

HARRISON'S IMPROVED POWER-LOOM.

Mr. Harrison, of Blackburn, not only exhibited two modern looms, for light and heavy goods respectively, but also added much interest to this part of the Exhibition, by placing, side by side with his improved machines, an old loom made about half a century since, at Abbey Mill, Paisley, and which is very similar to the power-looms at first worked in that district, in 1796, by Mr. Robert Miller, of Milton Pruffield, near Dumbarton. This old contrivance was considered a wonder at the time of its introduction, although only capable of running *sixty picks* or throws off of the shuttle per minute with advantage, besides requiring the constant attendance of one person. The new looms may be driven at the rate of 220 picks per minute, and were kept working at that speed in the Exhibition.

By the application of several improved motions, one person is enabled to attend to two, and in some cases three, looms at once. These motions are respectively known as the "weft protector," the "temple," the "positive taking-up motion," the "loose reed and break;" the first two of which motions have been patented by Messrs. Kenworthy and Bullough, of Blackburn; the loose reed and break by Mr. Bullough, and the fast reed and break by Mr. John Sellers, of Burnley.

The weft motion is a very simple and beautiful contrivance, consisting of a small fork which acts in connexion with the setting or handle of the loom; and whenever the weft thread breaks, or is absent from its place, the machine is immediately stopped by means of either of the above-mentioned breaks; it would otherwise go on weaving without weft, which would leave a part of the weft unfinished, and thus the piece would be entirely damaged. This motion, therefore, dispenses with the very great care and watchfulness hitherto required on the part of the operator, and enables him to produce more cloth in a given time, thus benefiting both his employers and himself. The "temple" is a long semi-cylindrical box or trough, into which is fitted a roller, cut or fluted to nearly one-third of its length at each end, so as to give it the appearance of a file. The use of this roller, which rotates on the trough, is to keep the fabric at one uniform width throughout the piece, and the sides free from perforations and rents, thus giving the whole a more finished appearance than usual.

In the old loom, already referred to, is also a temple, but it requires the aid of the operator to move it: thus his utmost attention is needed, without which it might continue to move with the fabric until it would be of no use at all; moreover, it perforates, and very often tears the sides of the cloth.

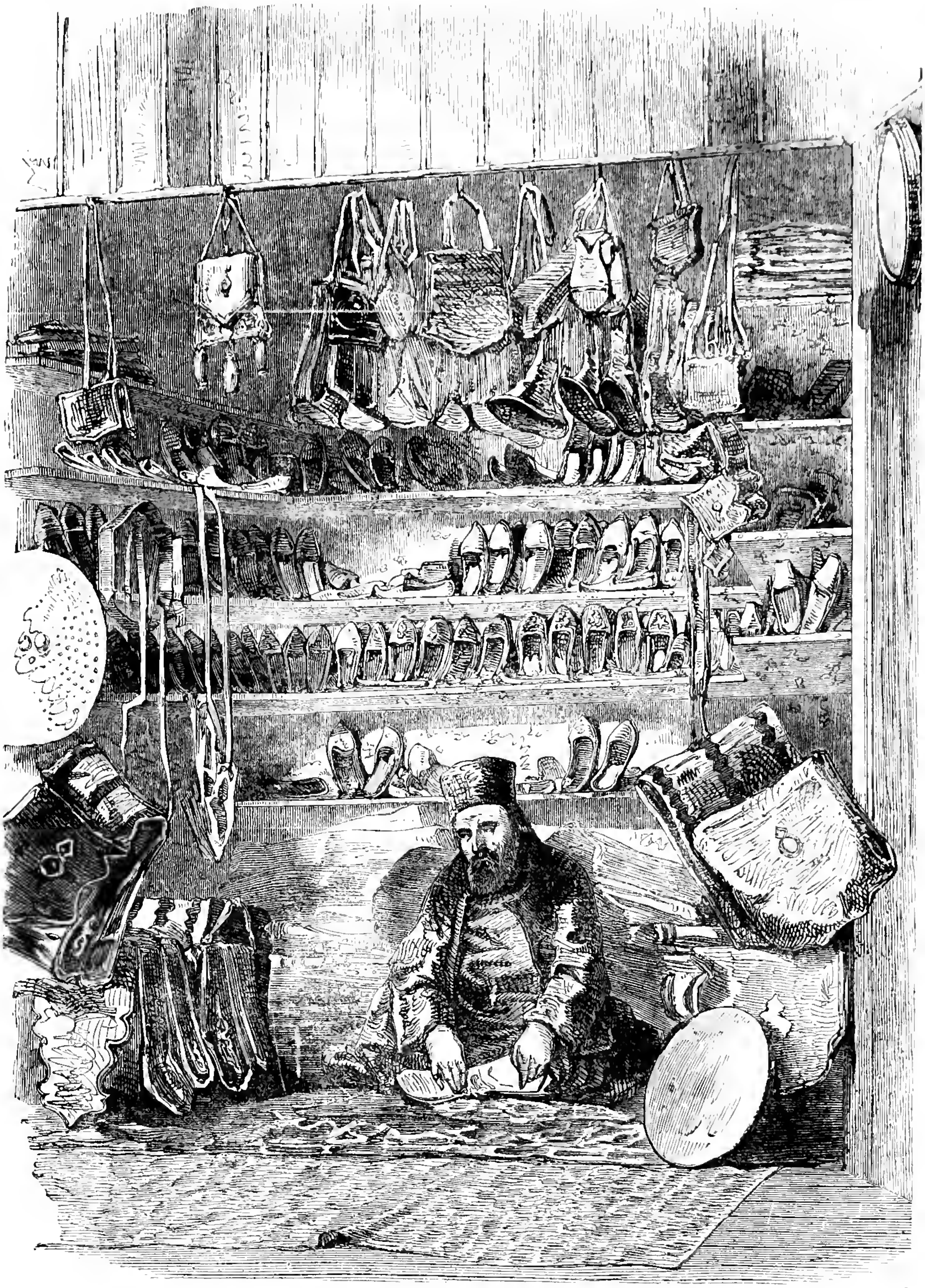
The "taking-up" motion is introduced for the purpose of ensuring uniformity of thickness throughout the piece, and regulates the number of threads of weft in a given space, by the application of a small wheel containing a certain number of teeth or cogs, acting in connexion with three other small wheels, and the cloth beam, which latter at one and the same time holds up the cloth and moves it so as to ensure the desired thickness throughout; whereas, without its use, the fabric may present different thicknesses throughout.

The loose reed and break of Mr. Bullough is the most suitable for light fabrics, and the fast reed and break of Mr. Sellers for heavy goods. Whenever the shuttle fails in traversing the sley from one end to the other, a great destruction of threads is almost certain to take place in the ordinary looms; but in those to which Mr. Bullough's invention is attached the loose reed falls out at its place, and gives way to the shuttle, so that no derangement or breakage of the warp can take place.

The above-named are the leading movements of the power-loom of the present day; but there are many other motions which are but little less effective to the complete and perfect working of the whole. By the old loom, which stands on the right-hand side of the two improved looms, not more than one-third the amount of cloth can be produced as compared with the workings of the new looms, although twice the amount of labour is required to produce the same quantity in a given time.

We understand that an experienced operative will produce twenty-six pieces, twenty-nine inches wide and twenty-nine yards long, of printing cloth of *eleven* picks per quarter inch, from two looms in a factory working sixty hours per week.

The weaving of each piece costs 5⅛d. The same person, if set to work at one of the old looms, could only produce four similar pieces, each of which would cost 2s. 9d. for weaving alone; thus an immense saving is effected by the new looms for weaving alone. With such facts before them, our readers will not be greatly at a loss to account for our vast superiority over all other nations of the globe in the production of every description of cotton fabrics.



THE TUNIS COURT.—(SEE PAGE 183.)

FOREIGN AND COLONIAL DEPARTMENTS.

EGYPT.

WE now pass from the Asiatic to the African continent, and propose to take a survey of the contributions of Egypt and Tunis to the Exhibition, the former of which, in addition to their intrinsic merit, were interesting from the imperishable halo of association that surrounds the land from which they came—a land which has been the seat of four civilisations, essentially differing from each other, and spread over the lapse of 4000 years; for while Italy and Greece have been at particular periods more resplendent by cultivation of the arts, Egypt is the only country that still shows in its monuments distinct traces of four successive epochs of civilisation—a Pharaonic, a Greek, a Roman, and an Arabic. This, no doubt, springs from the peculiarity of its physical geography, as a country of vast territorial wealth within a narrow space, and forming the connecting link between the Red Sea and the Mediterranean; while to the Englishman, more than to any other inhabitant in Europe, Egypt has become, since the development of steam navigation, that portion of the East the political condition of which bears most immediately on the communications between our vast Indian empire and the metropolis. There was a time, and that not long since, when our relations with the Government of that country were of the most hostile nature; but it is satisfactory to think that the most amicable intercourse now reigns between them. No Englishman in his senses thinks of a military occupation in Egypt similar to that which was attempted by France. The objects of the British Government limit themselves, first, to the exclusion of any European power from military possession of the key of the Mediterranean and Indian seas; secondly, to the development of our commerce in Egypt; thirdly, to the facilitation of the Overland traffic. And it is satisfactory to find, that the present Pacha shows every disposition not only to promote and protect our passenger traffic, but to cultivate the most amicable relations with the Government and inhabitants of this country.

In Egypt the extraordinary change that has been imprinted upon the administration, the commerce, the agriculture, and the manners of the higher classes (for those of the great majority of the people remain untouched) has been effected by the will of one *man*. It is true that Mahommed Ali sometimes misapplied his resources, but there can be no doubt of the extraordinary mental activity of the individual; there can be no doubt that all the productions of Europe have been subjected to study—that their application to European commerce has been tested, that the climate and soil have been studied, and that vast numbers of experiments have been made in the vegetable world, and that many plants have been successfully naturalised, while the indigenous products have been much improved in quality.

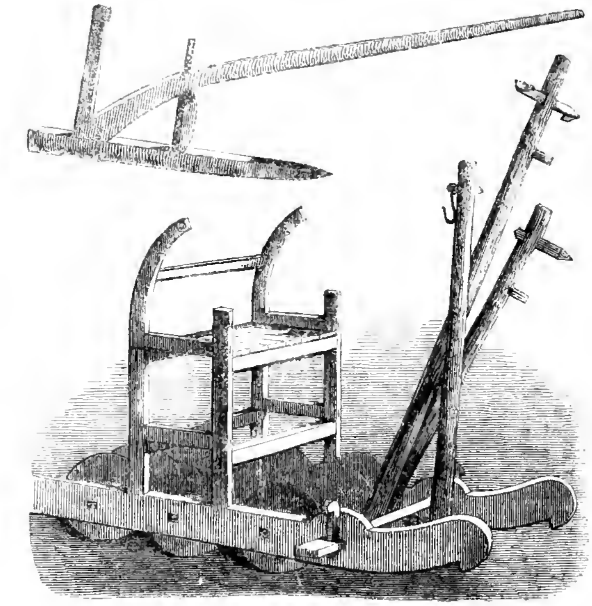
The Nile is the great feature of Egypt; let us, therefore, begin with the upper country. Highest of all were the articles from the Belledes-Asoudin, elephants' tusks, sections of ebony from Sennar, a rhinoceros horn, and other objects from the "land of the blacks," as the term means, of which the most valuable is gum. Upon this trade the genius of Mahommed Ali, remarkable as it was in many respects, had not a favourable influence; the European regulations and police, which he established with absolute power, rather frightened away than encouraged those who had objects of this description to sell from the interior of Africa; but, as the system of the present Pacha is less stringent, there is every prospect of an extension of this portion of the trade. And to this object, unquestionably, nothing would so much tend as the establishment of a fair, once every winter, at Essouan, which is the highest point that can be reached by steamers from Cairo, and is on the borders of Nubia.

In Upper Egypt the principal objects of production are dates, corn, sugar, and Indian corn; the first of which is the most striking feature of the Egyptian landscape, and which is almost as familiar to the eye of the European, by thousands of faithful representations, as to the Egyptian himself. On closer examination of the vases in which they are kept, we see the variety of their colour, some being of a dark red, some of a light brown, and others of a cream colour. Not only is the date an excellent food for the common people of Egypt, but we saw in this Exhibition illustrations of the varieties of purposes to which they are applied; here were the crates of the branch of the palm; the fly flappers of palm leaves, used by servants while their masters dine; and, moreover, specimens of the cordage into which the palm fibres are made, and a coarser description of which is in universal use in the Nile boats. When we add, that the trunk of the palm is used for timber, that the nuts are used both as camel fodder and as a combustible for the preparing of human food, and that, moreover, a tenacious hairy sort of fibre from the palm is used in cleansing the skin in baths, it is scarcely possible to over-rate the value of this tree.

Sugar cane and sugar-loaves were also exhibited, the latter from Ibrahim Pacha's refinery. This remarkable man made great efforts to push the sugar cultivation in Egypt, for which there can be no doubt that both soil and climate are well adapted; but the great proportion of the sugar used in Egypt is still imported from Europe: for whatever the will of Ibrahim Pacha may have been, or whatever may be the natural capacities of Egypt, the incurable indolence of the people, and their indisposition to labour, seem to be an invincible obstacle to Egypt ever competing with Europe in price and quality as far as this article is concerned. The true calling of Egypt is, unquestionably, that in which Nature herself—the Sun and the Nile—have the largest share in the production. It is by her wheat, her cotton, her beans, her barley, her sesame, her linseed, and her flax, that Egypt can increase her wealth with certainty. It is agriculture and commerce, not manufactures, that Nature has assigned to Egypt in the territorial division of labour.

Of these the most important is certainly cotton, from the great extension of its culture during late years. We particularly remarked a specimen of Sea Island cotton, cultivated by Mr. Larking, in the environs of Alexandria. This ingenious gentleman has devoted many years to the horticulture and agriculture of the Egyptian climate, and has been the means of reclaiming from the Lake Mareotis a large tract of land, which would otherwise have been useless, by diverting from the canal a portion of fresh water, which, washing away from the alluvial soil the saline particles, has left the earth cleansed and productive. He has also been at pains to introduce, upon a most extensive scale, the British system of agriculture, and the Belgian method of cultivating flax; but the inveterate habits of indolence and pilfering in the natives have prevented the experiment from being so successful as could have been wished.

In the Exhibition was to be seen one of those curious machines with

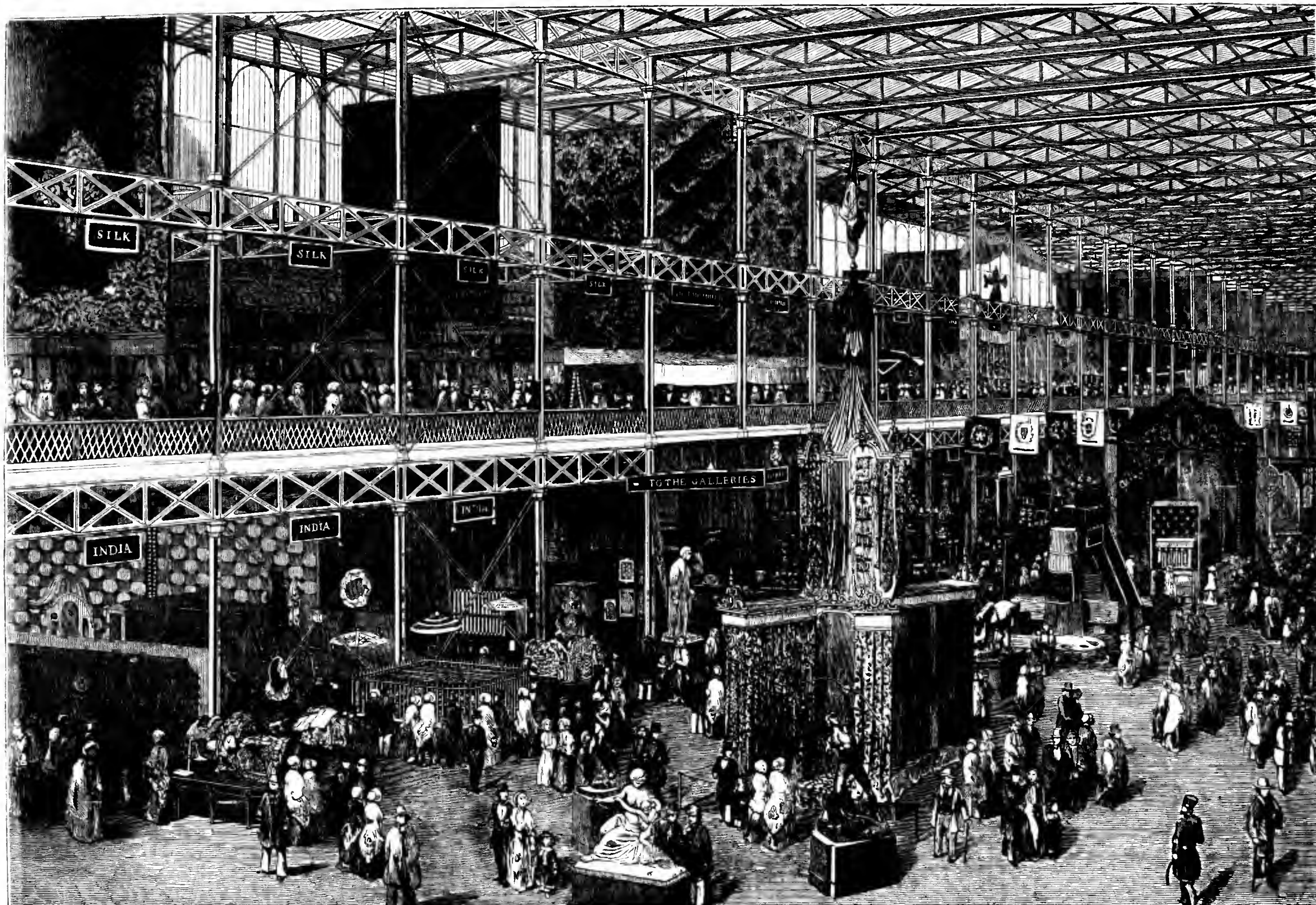


EGYPTIAN PLOUGH AND NOREZ MACHINE TO SOW SEED.

which the Egyptians conduct their agricultural operations (marked 174 in the Catalogue), which shows that the ease-loving countryman makes his own weight contribute to do the work, while he is saved the trouble of walking. The Catalogue states that the object of this machine is to sow seed; but, unless we are much mistaken, it is the machine used for the double purpose of thrashing corn and cutting the straw; the oxen performing a rotary motion until all the straw be cut and the corn squeezed out.

Of other vegetable productions were specimens of opium and senna, which are well suited to the climate; tombak, which is used as a substitute for tobacco in the water-pipes; and rice, which is grown in very large quantities on the low grounds of the Delta, not far from the sea, and cleaned for the most part at Damietta and Rosetta, where mills have been established on the American principle with great success. Nor must we, in our list of vegetable products, omit the rosewater of the Fayoum, which is so frequently mentioned in the songs of the Arab poets, whole tracts of land being devoted to this culture, and in the season of plucking diffusing fragrance through the smiling land. It is also in the Fayoum (which is a district to the west of the Nile above Cairo) that are to be found the greatest quantity of olives, large plantations of which have been re-established by Ibrahim Pacha in various parts of Egypt, for the culture of olives that had much fallen off under the Mamelukes.

The mineral productions of Egypt were very numerous, the most magnificent of which in the Exhibition were the slabs of Oriental alabaster, from the quarries to the south-east of Cairo, in the Desert, and out of which material the columns of the new Mosque of Mahommed Ali, in the citadel of Cairo, have been constructed. There can be no doubt, that, if the value and the beauty of this mineral were better known in Europe, and if a railway, of however rude and cheap construction, could be established to Beni Souef, on the Nile, it might become an article of export of the greatest importance. As a native manufacture, having a mineral for its component,



VIEW OF THE WESTERN NAVE OF THE GREAT EXHIBITION.

HISTORY OF INDUSTRIAL EXHIBITIONS.

V.—The Exhibitions of Belgium.

THE Minister of the Interior, while presiding at the opening of a Belgian national exhibition of native industry in 1847, said truly, "The Belgian people have always been distinguished for the aptitude they have displayed for the industrial arts; for the success which has attended their manufacturing enterprises, and for the rapidity with which they have asserted an honourable rank amongst European nations." The flourishing condition of this liberal and industrious country, with its dense population and fine manufacturing towns, attests, perhaps more than any other continental nation, the safety of relying upon the developments of civilisation, rather than leaning, with perverse indolence or mistaken and childish pride, upon traditional institutions.

Although Belgian productions have figured in other national exhibitions, only three exhibitions exclusively Belgian have been held. Belgian contributors figured honourably in the French official exhibitions of 1801 and 1802; and in the French exhibition of 1806 they occupied a distinct and honourable rank. While Belgium was only a French province, her manufacturers, of course, competed as compatriots with French manufacturers: but after the separation of Belgium from France and her union with Holland, her industrial productions were exhibited at the exhibitions of the Netherland States, of which she formed the southern province. The fifteen years during which the house of Nassau governed the destinies of Belgium form a melancholy epoch in the history of this country, curiously described by an old English writer as "the cockpit of Christendom." The Belgians, with their intense love of nationality and their Gallic blood, could not amalgamate with the sombre, unimaginative Dutchmen. Each saw in the other characteristics which kept alive a settled and determined enmity each saw that the policy of their respective countries required separate government. Holland, under the restrictive system of commerce, which, for the benefit of the Belgian provinces, was declared necessary, found her commerce decreasing, and that of Belgium rapidly extending—the business of Amsterdam was fast removing to the banks of the Scheldt: it was, therefore, with cordial pleasure that the Dutch and Belgians saw their governments divided—the Dutchman retreating to his table-land to reconstruct, by liberal commerce, his slackened business; and the Belgian to cultivate his fields and extend his factories under the warmth of a firmly-planted national flag. The history of Belgium, for the last fifteen years, fills up the happiest page of her troublous records. Having felt the yoke of three distinct continental tyrannies, she had now emerged from slavery, to vindicate, under the blessing of native and congenial institutions, the noble character of her children, and the fruitful capacities of her soil. Among the patriots who directed the current of popular events in the impetuous year 1830, and carried this country through the terrible dangers which attend even the most righteous civil war, M. Silvain Van der Weyer, now the representative of the Belgian nation in this country, was not the least conspicuous.

Belgium figured in four exhibitions of industry, conjointly with Holland. Of these, the first was held at Ghent, in 1820; one in Tournai, in 1824; one in Harlem, in 1825; and the last in Brussels, in 1830, at the very moment when the Prince of Orange was endeavouring to quell the discontent which Belgium then openly manifested towards the house of Nassau. At the exhibition of 1820, the contributors amounted to 560 only; whereas, that of 1830, held under the disturbing influence of grave political developments, mustered 1020, of whom no less than 813 were Belgians. The exhibition of 1835, however, held at Brussels, is, strictly, the first exhibition of industry exclusively Belgian. This first attempt to rally the manufacturers and agricultural farmers of Belgium, coming so soon after the convulsions and consequent commercial stagnation through which the liberated country had struggled, but which it had cheerfully submitted to for the sake of an idolised nationality, was necessarily, when compared with the last, a failure in point of numbers, and in the important signs of progress which have always marked the repetition of industrial exhibitions whenever they have been conducted on national grounds. Only 631 exhibitors figured at it; and the articles exhibited, though presenting a hopeful picture of future promise, were certainly inferior in character and excellence to the last exhibition of the Netherlands. The contrast, which, though it might be easily and fairly accounted for, did not flatter the national vanity of a people who had been told that they could not support themselves as an independent nation, raised fears and doubts in the minds of many men in authority when the official documents were issued summoning the industrial classes to send specimens of their skill to their capital in 1841. But the stride which the country had taken within the six years which intervened between the first and second Belgian exhibition, was immense and unprecedented. Progress had been small, too, it should be remembered, in the teeth of unusual commercial disasters—disasters which generally allow the labourers' tools to rust, and the workmen to starve.

The terrible commercial crisis with which the year 1838 closed, and the effect of which was so lasting, very naturally called up fears in the minds of men whose very independence was yet an experiment. It was an easy matter to fill the vast galleries of the Belgian Museum of Industry; but the manufacturers naturally dreaded, that, in spite of their most strenuous efforts, the deplorable disasters amid which they had laboured would divulge their sad results in the nature of their manufactures. However, in the month of February, 1840, the Chevalier de Theux de Meylandt, then Minister of the Interior, issued a royal decree intimating that on the 15th of July, 1841, a public exhibiton of national industry would be opened; and that the government of the exhibition would be confided to a commission consisting of ten members. Provincial committees were also appointed, having powers of selection and rejection over articles within their jurisdiction; and the Ministry announced that the jury would pay particular attention, in its decisions, to the utility and cheapness, as well as to the artistic merits and technical excellence, of articles exhibited. The government further reserved to itself the power of acquiring, by purchase, any articles exhibited, with the view of perfecting a national museum of industry. The expenses of carriage were defrayed by the government. Exhibitors were invited to send the trading price of articles to the jury, and they were allowed to display the prices upon their goods at the exhibition.

Delay having taken place in the transmission or arrangement of goods, the exhibition was not ready till the 1st of August, 1841, on which day M. Nothomb (the new Minister of the Interior) formally opened the galleries of the Musée Industriel to the Belgian public. On this occasion, the president of the Exhibition Committee addressed the Minister on the character of the exhibition in these hopeful words:—"You will see, sir, by the number and the variety of the products exhibited, the extension and development of Belgian industry which have marked the years which have passed over us since our last exhibition was closed. Though remarkable for many manufacturing excellences, this exhibition will be noticed chiefly for the useful nature and cheapness of the greater part of its contents. Belgium, having worked out the problem of economic production, now pauses to find channels for the profitable export of her superabundance." In reply to this address, the Minister referred to the sixty leagues of railway which had been laid down in Belgium since 1835. The object of the exhibition of 1835 was to demonstrate that Belgian industry had not perished in the struggle which had emancipated the country; but the Minister frankly owned that the country had other and brighter hopes in the exhibition upon which the doors were then falling back. In continuation, M. Nothomb warned the Belgians that the brilliant bazaar, which justly flattered the national pride, by no means represented fully the industry of the country; inasmuch as many and great departments of industry—many exhaustless sources of wealth—as, for instance, coals (the production of which had lately been enormously extended), could not be represented at such an institution.

The jury who reported on this exhibition, in a preamble to their official declaration, characterised the gathering of industries as one where trials of strength were rare, where exceptional contributions were few, but where there were a vast number of articles, on the excellence of which the manufacturing prosperity of a country must rest. "We are," said the jury, "the first to admire an exquisite fabric, rich and splendid lace, a model royal equipage, or a grand palatial ornament; but we examine with more attention and interest than we devote to these achievements, those projects which are destined for the great mass of consumers. In what relative importance does the finest fabric stand to that coarse material which is to cover the bare back of the weaver?" Happily the jury preferred to see a product that would carry comfort into the homes of the people, before the lace destined to cover—the more to display—the heightened beauties of a duchess. In this they showed how truly they comprehended the spirit of the times they were approaching, and how worthy they were to enjoy the complete independence which their countrymen had established.

The number of contributors to this exhibition was 975. Of these, 76 were from Anvers, 403 from Brabant, 152 from West Flanders, 136 from East Flanders, 77 from Hainault, 73 from Liege, 8 from Limbourg, 13 from Luxembourg, and 32 from Namur.

The growth and preparation of flax, which is the great industry of Belgium, and particularly of East and West Flanders, had increased marvellously. The industry which had for years been worth an average of two millions sterling to the country, had been assiduously nurtured. Belgium, that in 1835 possessed only one spinning factory, boasted in 1841 no less than eight in full activity, employing forty-seven thousand machines. From the Tournai factory of MM. Boucher, flax threads spun to the fineness of No. 300 were noticed by the jury, and the manufacturers rewarded by a gold medal. The flax-spinning factories of the Société de la Lys, of Ghent, and the Société de St. Leonard, of Liege, also obtained gold medals. The linens of Flanders exhibited were not remarkable, and the jury expressed their regret that the manufacture of cambrics, the birth of which in Belgium they had rewarded in 1835, appeared to have ceased to exist. The manufacture of sail-cloths, however, had been considerably extended and improved by M. Kums, who had invented and patented a loom for weaving this coarse but important fabric. In damask linens, however, the exhibition was rich—indicating the brilliant future that lay in the spinning jenny and the Jacquard machine. Manufacturers had begun to employ Jacquard's loom extensively, and, by the adoption of this economy in labour, to place the manufacturers of Courtrai in a position to compete with those of Silesia. For specimens of damask linens, MM Poelman and Fervacke, of Ghent, and T. Gysbrechts and Lonsberg, of Malines, obtained gold medals; and

we may also draw attention to the porous water-bottles made at Ghonoh, on the Nile, which are in universal use in all parts of Egypt, from their peculiar quality of exuding the moisture, which by evaporation cools the water within. If we descend the Nile to the entrance of Cairo, we see another mineral production, in specimens of the petrified forest of a valley in Mount Mokattam.

The Cairo articles must be regarded under two aspects—those which are indigenous, and those which have been introduced by the late Pacha as subservient to his military and political system. The latter need not engage our attention, as they have no local colour, however illustrative they may be of the superior mental activity of the family of the present Pacha. Of the former, we may mention the saddles of crimson velvet, the padded one being most easy and convenient for riding, giving a good hold to the knee; but the high cantled saddle is the most interesting, for it is of the same form as that in which Saladin and the Paynim host used to receive the shock of the Frank Crusader; the saddle of Negm-Eddin, whose name is so associated with the expedition of St. Louis to Damietta, being still an appendage of the Mosque, that, after six centuries, bears his name.

In no respect had the desire of Mahommed Ali to leave his impress upon this country, been more successful than in his efforts to promote public instruction; and the schools he established in Egypt will unquestionably do more for his reputation than the wars in which he was engaged. The printing-press at Boulak has been sufficiently described by travellers; and we have had specimens of its work in an Egyptian edition of the "Arabian Nights," and other productions of typography; the works themselves being remarkable, not so much for their beauty of print and paper, in which they cannot compete with Europe, as for the excessive lowness of price.

The articles of dress are so numerous, and are brought in such quantities by travellers to this country, that we need not take up the reader's time any further; simply remarking, that while many of the imitations of European manufactures have not been successful as pecuniary speculations, that of Tunis caps, established at Fouah, has been in operation for many years, and has been eminently prosperous.

THE TUNIS COURT.

The Tunis court or bay was the first on the right hand after passing through the iron gates at the south entrance. In front it was the width of a single division; but in the rear it was more extensive. The collection of Tunisian productions which were sent for exhibition by the Bey of Tunis, under the care of Sy Hamda Elmkadden, pro-commissary appointed for the occasion, and Moses Santillana, interpreter to his Excellency General Sidy Mahmond Benyad, the Bey's commissioner, were more remarkable as matters of curiosity than for their intrinsic value or importance. The most striking features in the outward show were some carpets, rugs, and blankets, and a variety of singularly-fashioned garments, for male and female, of a mixed material of silk and worsted, and of all shades and mixture of colour; caps of various denominations—calabash, orta, sake, majidia, kaleb-shed, &c.—turbans, and other head-gear; silk scarfs; in short, an endless stock of gentlemen's and ladies' "left-off clothing"—just such a stock as one might expect to see in a native old clothes' shop at Algiers or at Cairo. Two hats of gigantic proportions, in red morocco, were the astonishment of all beholders. In the inner room were others of similar dimensions, but made of straw, and ornamented with leather patches. The shoes, boots, and slippers of red, green, and yellow morocco, attracted the attention of the curious, as also some very substantial saddle-bags of the same material, which, divided in two, might form very serviceable packs for a walking tour in Wales or Switzerland. Then there were samples of seeds, of saffron, of indigo, and glass jars full of sweetmeats, which last-named the good natured Turk in charge very freely dispensed, with wild gestures of welcome, to gaping juveniles as they passed. Arms and gun-locks of clumsy make were displayed in another compartment; in another various articles for domestic use, made of iron, tin, leather, and pottery, and of very primitive fashion; squares of "household soap," some candles also, veritable "dips" of a dirty brown colour. In another we found musical instruments, including a lute and a timbrel; and strewed about in all directions were skins of animals, dressed and undressed; pieces of matting, parasols, fans, ornaments in gold and silver; claret bottles filled, some with scented waters, some with Begia snuff; and all sorts of odds and ends, mostly of the rudest description, but all admirably calculated to afford illustration of the *ménage* and *convenances* of the North African tribes. A tent made of camel's hair cloth, which stood in the middle of the room was a perfect picture, low, dark, dismal—a mere shelter for the mountain wanderer from the blast and the rain; in which saddles, saddle-bags, leather water-bags, leather bottles, leather mats, clumsy arms, and other articles for immediate use, and adapted for prompt removal, were scattered about in admired disorder. In strange contrast to this tatterdemalion lot stood two glass cases, containing some very splendid specimens of gold embroidered dresses and horse caparisons, and other articles of *vertù* selected from the Bey's private wardrobe. Nor must we omit to mention some very curious models of arabesque carvings in gypsum, intended for the decoration of the interior of Moorish rooms. Their workmanship is of a bold character, the devices elaborate and pleasing, and the material being pierced through, must have a very light and graceful effect when applied to the purposes intended. Preparatory to the process of carving, the gypsum is inclosed in a wooden frame, with a back to it, which supports and protects it till the design is completed.

ENGINE-PIT OF THE WALBOTTLE COLLIERY.

In connexion with our article on "Coal, Peat, &c.," in the present number, we give on pages 188 and 189, two sections of the engine-pit, Walbottle Colliery, in the county of Northumberland, showing the arrangement of engine, pumps, &c., as erected in 1846, by R. and W. Hawthorn, and drawn by John Hodgson, consulting engineer. Scale quarter of an inch to the foot. The drawings are each 12 feet long and 4½ feet broad, and represent the whole of the coal seams and strata, with the water levels, &c. The principal feature in the arrangement is the economy and simplicity of working a forcing or plunger pipe, with two lifting-pumps, by spears direct from the beam of a double-acting condensing steam-engine, on the expansive principle, without any balance weight; the engine being equally loaded at the in-door and out-door stroke.

We have selected for our illustrations the principal parts of these beautiful and interesting drawings, to give our readers some idea how the water by this arrangement is pumped out of the coal-mines; and we regret that we cannot on a small scale represent the sections of the strata, so that they could be generally understood. The parts we have represented are reduced to half the size of the original drawings.

Fig. 1 is an elevation of the engine and upper portion of the delivery-pipe of the forcing-pumps, with the main spears or pump rods; and Fig. 2 an end elevation of the same. Fig. 3 a section, and Fig. 4 an elevation, of the forcing-pump, with the spears and the top end of the lifting-pumps, showing the cistern and method of connecting the spears on each side of the plunger; and Figs. 5 and 6 a section and elevation of the bottom end of the lifting pumps, showing the bucket and clacks.

The following are the principal dimensions, viz.:—Cylinder, 77 inches diameter; stroke of piston, 10 feet; beam 17½ feet and 14 feet = 31½ feet; total length of stroke of pumps in the pit, 8 feet; diameter of the plunger or ram 28¾ inches: the diameter of the two lifting or bucket pumps, 16¾ inches. The pumps deliver from 1100 to 1500 gallons of water per minute, according as the engine is required to make 5 to 7 strokes per minute.

The water level drift A, in connexion with other drifts to the lower coal seams and the pipe B, from a coal seam below the forcing-pump, conveys the whole of the water from the workings of the colliery below a certain level to the bottom of the pit, and it is raised by the two lifting-pumps to the cistern C. The drift D collects the water from the upper coal seams, and is conveyed by a pipe to the cistern C, the pipe being provided with a valve so as to shut off the supply when necessary. The whole of the water, as it is thus collected into the cistern C, is forced by the plunger-pump up the pipes E to the surface water level drift F, through which it flows to a neighbouring valley—the sizes of the two lifting-pumps, and the supply of water from the upper levels, being so adjusted as to equal the capacity of the plunger-pump—the weight and load upon the engine being also equally adjusted at each return of the up and down stroke of the pumps.

GOTHIC BOOKCASE.—BY LEISTLERS, OF VIENNA.

This magnificent piece of furniture was sent over as a present from the Emperor of Austria to her Majesty; the superbly bound books which ornament some of the shelves are also the gift of his Imperial Majesty. The material is oak. The design, which is Gothic, is by Bernardo de Bernardis, an architect of eminence, and J. Kraner, both of Vienna. It is rather too architectural in its arrangement, and the introduction of the statuettes in all directions is not to be approved on the score of taste or propriety. The executive department has been very creditably carried out; but at the time it was exhibited the joining business had not been completed: and we understand several workmen belonging to Messrs. Leistler's establishment are now engaged upon it, and will be so for some months, at Buckingham Palace.

VIEW OF THE WESTERN NAVE.

Across the next two pages we give a general view of the Western Nave of the Crystal Palace, exhibiting at a glance the principal objects in the British Department. First, perhaps, in interest and importance, stands the splendid trophy of Spitalfields silk, erected by Messrs. Keith. This richly-clothed and decorated object formed a decided feature of the Exhibition, and consisted of a parallelogram of mirrors with a wing at each of the angles, on which were draped the richest furniture damasks in well-selected and effective colourings. The structure was divided into three tiers, and rose to the height of forty feet, above which were placed the flags and banner. The lower tier displayed the broad silks of the largest patterns; and at certain angles these were reflected in the mirrors; whilst selections of silks were arranged upon a plinth which supported the whole, an ornamental *fascia* completing the first compartment. From this rose the second tier, in which, however, too many silks were crowded, and the effect was lost in consequence. The arrangement, too, might have been more loose and pendent in its character, thus giving ease to the folds of the drapery. This remark applies especially to the upper tier, in which the less costly, but, in some respects, the more showy goods, such as striped tabarets, were placed. Great credit, however, is due to Messrs. Keith and Co., for the spirit and energy they have displayed in taking up this costly illustration of their trade single-handed; and the examples of silk of which it was formed were, with a few exceptions, equally creditable to their skill and taste as manufacturers.

M. C. Dujardin, of Courtrai, the recal of one given to him at a previous exhibition.

The woollen manufactures of Belgium, which, in spite of the impossibility of growing wool on the small farms of the country, and the necessity of relying upon foreign markets for this raw material, had steadily increased in importance, from an average annual production of cloth in 1789 of 20,000 pieces, to one of 122,000 pieces in 1838,* figured honourably at the Belgian exhibition of 1841; and MM. Grand Ry and Poswick, of Verviers, obtained a gold medal for their specimens of spun wool. Other woollen manufacturers obtained medals on this occasion; and the Belgian cloths exhibited appear to have justified the high eulogiums which were heaped upon this fine industry.

The directors of the splendid royal carpet manufactory of Tournai exhibited on this occasion some fine specimens of their looms, executed after designs in the style of the *rénaissance*, for the Sardinian Court. These specimens obtained for the manufacturers the award of a gold medal.

The cotton manufactures of Belgium, consuming an annual average quantity of cotton estimated at 7,000,000 kilogrammes, and keeping 5000 power, and 6000 hand-looms in constant activity, and concentrating a vast industrial population around Ghent, were but very feebly represented at this exhibition. This weakness was attributed by the jury to a wish on the part of the cotton lords, to appear dejected and miserable, and to exaggerate the decline in the cotton manufactures of the country since the revolution of 1830.

The jury reported faithfully the successful efforts which had been lately made to establish silk manufactures in Belgium; and particularly referred to the great manufactory of Lierre, employing ninety looms with this beautiful material.

The specimens of lace exhibited attested the survival of that traditional excellence in which Belgium takes such pride. Around Brussels, Malines, Anvers, Bruges, Menin, Ypres, Grammont, and Aloot, nearly 60,000 women are engaged in the fabrication of lace. In the village schools of Flanders, and in the farm-houses, the feminine industry of which has been superseded by the spinning-jenny, women and children are taught to weave the splendid patterns of those costly webs which float about the forms of wealthy womanhood. A splendid assortment of the result of this industry was exhibited in 1841. Without entering into the relative beauties of Brussels point, of Valenciennes, and other laces, it may be interesting to notice the specimen of lace-work, representing, by means of a needle and thread, an allegorical picture of the attributes of industry, commerce, art, and science, for which a gold medal was awarded to M. Tardent Poilet, of Brussels.

The metallic wealth of Belgium, which, after having laboured under the disadvantages and disasters which follow rash and impetuous speculation, was beginning to bear a salutary effect upon native commerce, contributed largely to the attractions of the exhibition of 1841. The exhibitors of manufactures in metals were numerous, their products were extremely various, and decidedly indicative of a dawning prosperity. The reputation of the cannon foundry of Liege had already secured to its directors orders from many foreign powers: and the excellences of the firms of Couillet and Marcinelle, of the Société de Monceaux sur Sambre, of the Société de l'Espérance, Leraing, were thought severally worthy of gold medals. That part of the exhibition devoted to machinery was dwelt upon by the jury with great warmth. Within ten years the manufacture of machinery in Belgium had risen from being an obscure and insignificant branch of industry, to assume the importance of a manufacturing specialty, worth an annual average sum of 18,000,000 francs.

Altogether, 41 gold medals, 119 silver medals, 282 bronze medals, 72 recals of former medals, and 148 "mentions honorables," were accorded to exhibitors on this occasion. Crowds of foreigners flocked to the exhibition: and the solemnity with which the various prizes were distributed, in the presence of the King and Queen, tended to give men a pleasing notion of the honour which Belgian authorities attached to the successes of industry. The loud applause which greeted a young girl belonging to one of the poor-houses of Bruges, when she advanced to receive a gold medal awarded to her by the jury, indicated that wholesome public esteem of skilled labour which other countries might well envy.

The last industrial exhibition of Belgium, held in the year 1847, was remarkable for a feature, the importance and wisdom of which it is impossible to overrate. The jury for this exhibition were called upon by the then Minister of the Interior, in addition to the usual labours devolving upon an exhibition committee, to arrange a plan for the foundation of a new order of rewards, to be specially reserved for working men who distinguished themselves by their lives and their excellence as workmen. In addition, this jury were further instructed to inquire into the means at hand for the formation of societies in which the savings of workmen could be placed to the best advantage. The letter of the Minister of the Interior on this subject well merits place in a history of industrial exhibitions:—

"FROM THE MINISTER OF THE INTERIOR TO THE JURY.

"*Brussels, September* 9, 1847.

"Gentlemen,—The labourers and artisans who work under the direction, and for the profit of masters, have not up to the present time participated in the rewards and honours which the Government have been anxious to award to industry. Working-men—more than other classes—would esteem highly any public rewards accorded to them; and their emulation being in this way awakened, would lead them to improve as labourers and citizens. Medals of honour might be distributed to workmen recommended by their masters, as skilful, well-behaved, and [illegible] their families. By withholding such distinction from [illegible] discontented, destitute of discipline, not punctual in their labour, given to drunken habits, [illegible] manners would in all probability be [illegible] and lessen the necessity for the imposition of those fines which are now serious evils in manufacturing communities. The medals should be manufactured to be worn at the button-hole, and should bear the name of the owner, with the words '*Récompense Nationale*.' "M. Rogier, Minister of the Interior."

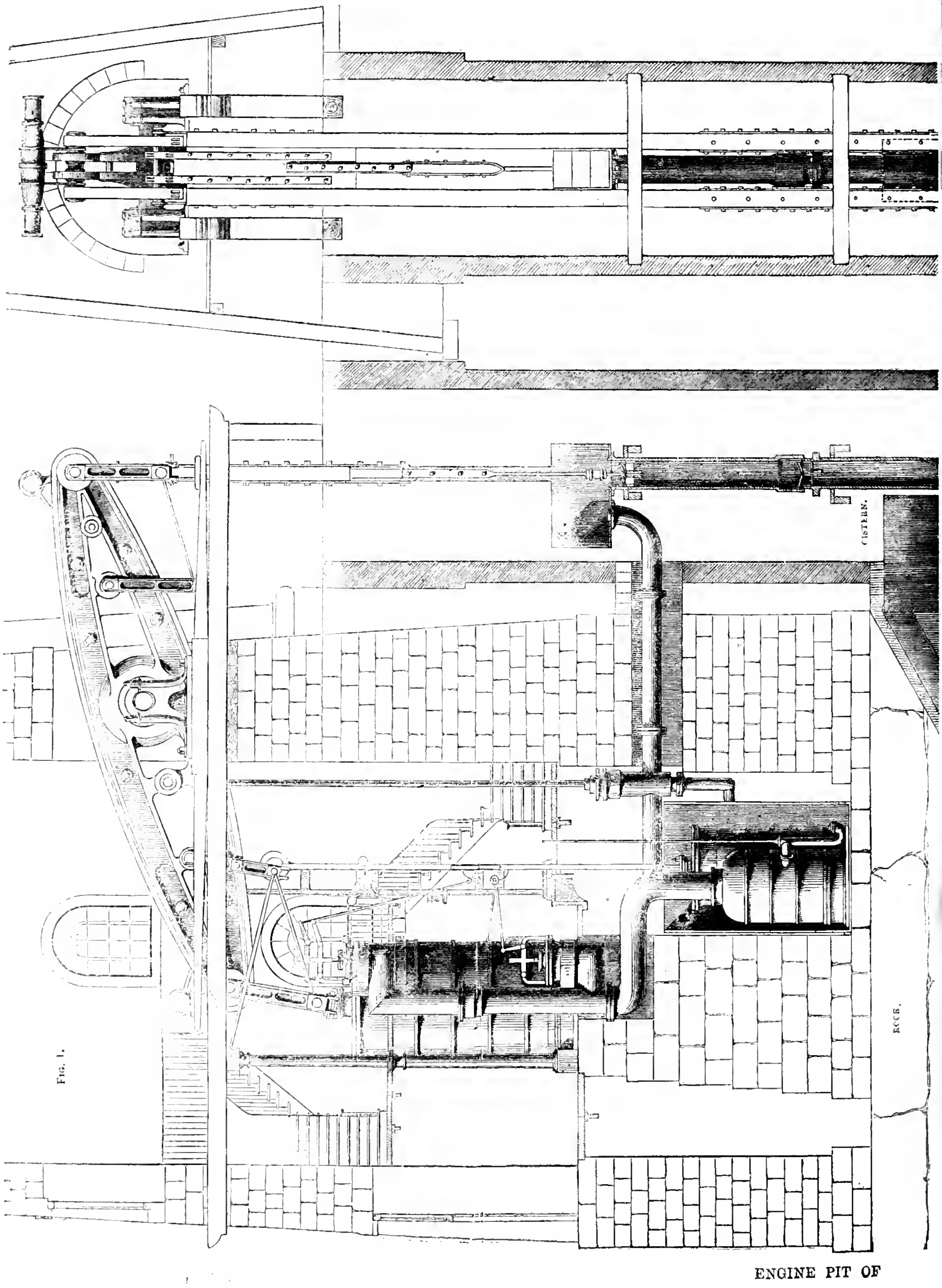
M. Rogier's plan was not to strike medals to decorate every good workman in Belgium, but to do an act of justice to those men and women who had realised the conceptions of the manufacturing exhibitors. It was arranged finally, that a thousand medals should be struck, and it was estimated that of these about two hundred would relapse to Government every six years, so that this number could be awarded at every exhibition. The medals given to women differed slightly from those given to men, bearing the words "*Habileté, Moralité*," instead of "*Récompense Nationale*." At the distribution of rewards to the exhibitors of 1847, nineteen workwomen, (of whom nine were lacemakers), and 201 workmen received decorations. The policy or propriety of giving a reward to a man who has reared up an unusually large family upon the smallest possible pittance of wages is at least questionable; but the just recognition of the workman's services to the manufacturing condition of his country, cannot be viewed with displeasure by any mind the vision of which is not distorted.

The exhibition of 1847 was opened on the 15th of July in that year; and the price at which the public was admitted was fixed at ten sous, on three days of the week. Three days, weekly, the exhibition was opened free; and on the seventh day, was given up entirely to the jury. This exhibition included very few exhibitors of the staple produce of the country — flax: a deficiency which the jury lamented, and for which they could, in no reasonable way, account. Linen manufactures, however, had made rapid and indisputable progress. The Société de St. Leonard, of Liege, rewarded at the exhibition of 1841 by a gold medal, and the Société de la Lys, of Ghent, had, respectively, doubled the extent of their establishments since that time. The progress of these societies was acknowledged by the jury on this occasion with the recal of the medals given in 1841. The depressed condition of the cotton manufacturers of Belgium kept them from this exhibition, as from the last; even printed cottons found only five representatives. In specimens of rich lace, this exhibition also showed a falling off in comparison with that of 1841. Ypres and Courtrai, the great centres of the Valenciennes lace manufactures, were almost without representatives. In the department of metal manufactures, the jury found ample consolation for the deficiencies in that devoted to textile fabrics. Iron manufactures, which in 1841 were in a complete state of stagnation, began to revive in 1844, as railway speculation increased and the price of English iron rose. Over-production, however, and the mania of 1846, were just then beginning to produce their lamentable consequences; but these were not sufficiently developed at the time of the opening of this exhibition to make ironfounders indifferent as to the representation of their great industry. Accordingly we find the metallic wealth of Belgium splendidly developed in every possible way at this exhibition. At the distribution of prizes on this occasion, M. Charles de Brouchere, president of the jury (and whose name should receive honourable mention in any notice of Belgian exhibitors), addressed the Minister of the Interior in these terms:—"The festival, which crowns the glory of our industrial exhibition, receives particular *éclat* from the fact that at this exhibition agricultural industry has taken its place beside manufacturing industry. For the first time we behold the sources of our national wealth united and intermingled; for the first time the Government extends its rewards to all classes of the industrial community, and thus inaugurates a happy future for Belgium. The exhibition of 1847 is an advance upon all its predecessors, both as regards the number of exhibitors and the character of the articles exhibited." This eulogy was deserved. In textile fabrics, in machinery, in cutlery, china, and hardware, in the chemical arts, and in beauty of designs, the Belgian exhibition revealed a hopeful and happy picture of promise in the future. All who admire an energetic and spiritual nation, will hope to find this promise fully realised.

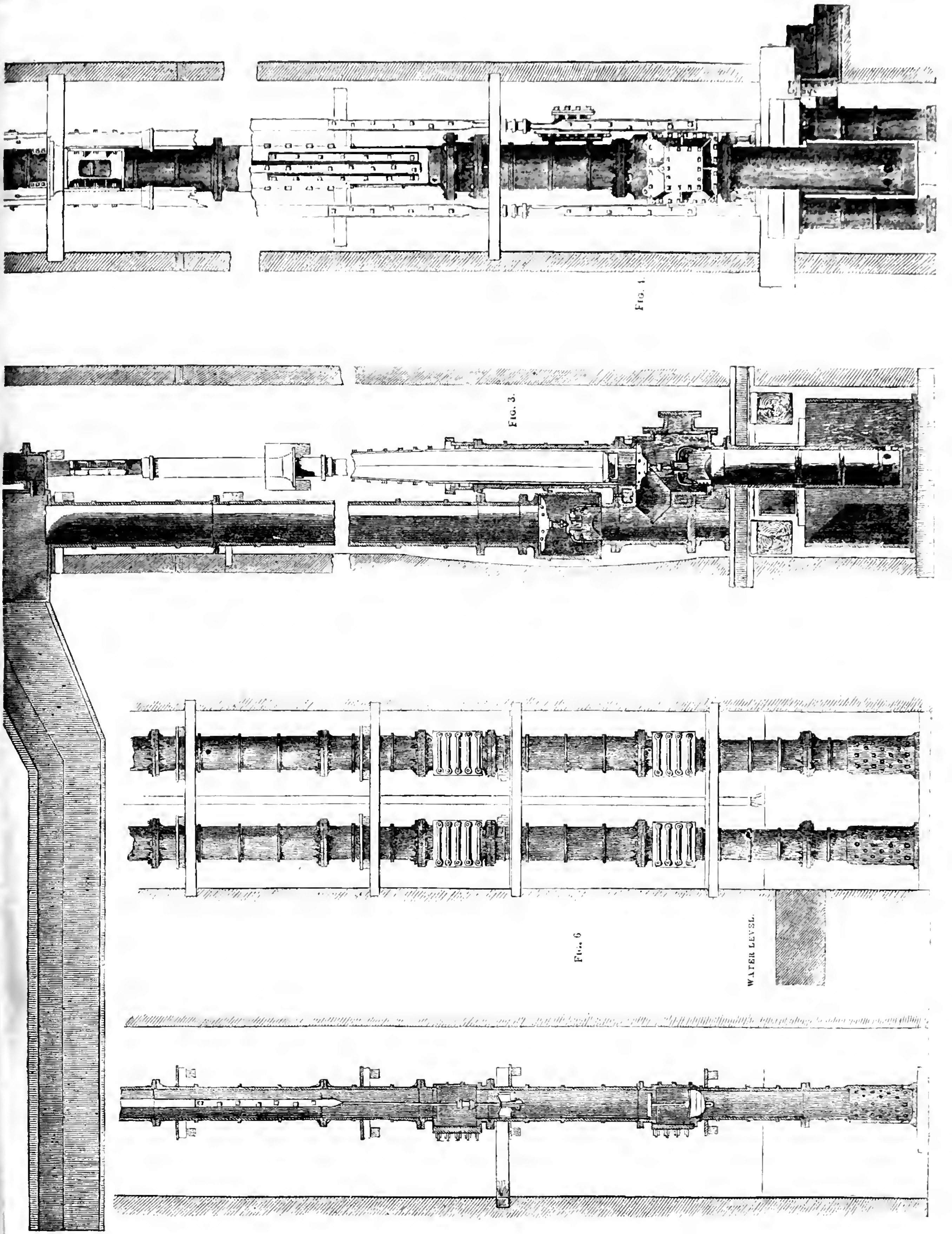
Supply of Coals.—Within the last twelve months, in consequence of the facilities afforded by railways for the cheap and speedy transit of coals from the various parts of the kingdom to the metropolis, the inhabitants of London have enjoyed cheap fires as well as cheap bread. The supply is on the increase, and consequently we look forward to a further reduction of price. The Great Western and Forest of Dean Coal Company have been established to supply the coals of that locality, which possesses many extensive seams of coal of first-rate quality. The west, the north, and the midland counties will thus be brought into active competition in the London market, and the public must necessarily reap the benefit.

Presents of the East India Company to Her Majesty.—The East India Company have presented some of the most admired objects, contributed by them to the Great Exhibition, to Her Majesty. This splendid *cadeau* is composed chiefly of precious stones and articles of *vertu*; but comprises also valuable shawls and rich muslins, stuffs from Dacca, and other places.

* M. N. Briavoinne, "L' Industrie en Belgique."



ENGINE PIT OF



THE WALBOTTLE COLLIERY.

COAL, PEAT &c.

THE visitor arriving at the Exhibition Building from the west, or passing out from that extremity, could not fail to be struck by a number of large objects there collected and arranged, amongst which some gigantic blocks of coal were not the least remarkable. These formed part of a noble series of specimens of mineral fuel, most of them, as might be expected, the produce of English mines, and capable of giving to the general observer, as well as the practical man, a most valuable idea of the relative as well as positive importance of this source of our country's wealth. We propose to detain the reader a little in the consideration of this subject, as one worthy, from its general interest as well as its importance, of special notice on the present occasion.

Mineral fuel exists in various ways in the earth, if by this term we include, as we may fairly do, all those deposits in any sense available for fuel which form now an essential part of the earth's external layer or surface. Using the expression in this general way, we understand it to mean peat and turf, as well as coal: and not only such coal as is brought to us from Newcastle, Lancashire, Yorkshire, South Wales, or other places in the great coal districts of the north and west, which chiefly supply London, but the less perfect and much less valuable material obtained in other countries and other places, and known technically as lignite, or brown coal.

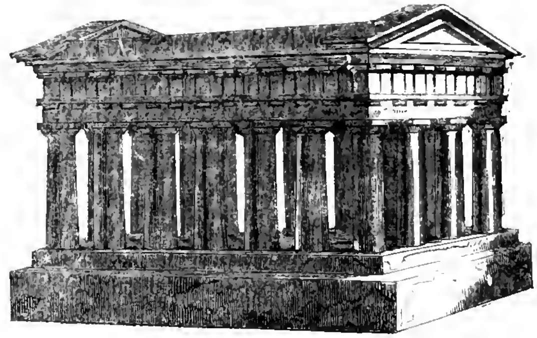
Peat, like all other supplies of fuel from the earth, is nothing more than vegetation of some kind in a more or less altered state. When, owing to any cause, the decomposition of dead plants is checked or prevented, a gradual and steady accumulation takes place; and, where circumstances are favourable, this is much assisted by a particular kind of moss, making, with the other plants, a spongy semi-fluid mass, which gradually increases till the magnitude becomes as large as the condition of the surrounding ground will admit. From twelve to twenty feet is no uncommon depth for such material; and so great is the surface extent, that not less than one-seventh part of the whole of Ireland is thus occupied. Anything which could render this peat available as fuel at a price at all competing with that of coal, would, unquestionably, be a great advantage to a country like Ireland, and also to many parts of Germany; and several such methods have been adopted, which were illustrated in the general collection in Class 1. We may refer here more particularly to the preparations by Mr. Jasper Rogers, and those by Mr. Evans (Stone's patent), and Mr. Cobbold —the latter effected, we believe, by centrifugal force without pressure and while the material is in a pulpy state, and certainly yielding some very curious material resembling jet, and capable of being turned in the lathe. Mr. Evans exhibited chiefly the numerous products obtained by the destructive distillation of peat, the economic value of which does not at present seem very distinctly proved, but which are well worthy of experiment; while the interest excited by the products exhibited by Mr. Rogers has a wider range, as it is connected with large sanatory questions and the employment of peat charcoal for manure.

The great objection to peat as a fuel has generally arisen from the large quantity of water which it contains even when it has been exposed to the ordinary process of drying. This air-dried peat, even under favourable circumstances, contains no less than one-fourth part of its weight of water, and in any use of the substance as fuel, the first thing that has to be done during combustion is to turn into steam and drive off by evaporation this extraneous moisture. In charring peat the result of the water is seen in another way; for as it is present chiefly in the little cells of the plants of which the mass is made up, the charcoal produced is very light and easily reduced to fine powder, just as would be the case if leaves, twigs and mosses were burnt. The very light and porous state thus obtained is unfavourable for the use of the fuel in cases where great heat is needed, and where a blast of air is employed. All these objections to peat and charred peat are, however, much diminished, and even removed, when the peat is reduced to a more compact substance, and the water got rid of. By some contrivance the weight of such prepared fuel is greater than that of a similar block of coal, and the charcoal is more dense than that from wood. When we consider that in Ireland, as we have already said, not less than one-seventh of the whole surface of the country is covered by bog, while coal, where it exists, is dear and not very good, the vast importance of the utilisation of peat will be at once appreciated. With regard to the relative value of peat and coal, it may be sufficient to say, that 1lb. of ordinary peat will evaporate $4\frac{1}{4}$ lb. of water; 1lb. of perfectly dry peat will evaporate 6lb. of water; 1lb. of Newcastle coal will evaporate 7lb. of water, and 1lb. of pure Welsh anthracite as much as $10\frac{1}{2}$lb. Compressed peat varies in this respect according to the method adopted to bring it into a convenient and valuable form.

There is a form of mineral fuel of which we have but few and unimportant examples in this country, but which is incredibly abundant in several parts of the Continent where coal is comparatively rare. This material is called *lignite*, and consists, generally, of large accumulations of trunks of trees heaped together in particular places to a thickness of 40, 50, 100, or even 200 feet, and occupying sometimes a considerable space. Even in Ireland, on the shores of Lough Neagh, this substance exists in three beds, having a total thickness of 60 feet, and extending over 100 square miles, so that its economic value is really very considerable. At Bovey Tracey, in Devonshire, similar beds exist, but of smaller size, and these are actually worked, the lignite being used in some potteries in the neighbourhood. T value of lignite as fuel has not yet been appreciated, as there are some portant practical difficulties in the way of its use, connected with presence of water and earthy impurities. There can, however, be no dou that before long these vast stores will be rendered available, especially wh as is the case with Austria, they exist in the immediate vicinity of supp of iron ore, practically inexhaustible. Those interested in examin material of this kind might have found amongst the foreign goods sc samples of lignite as obtained from Moravia and Syria, and used in Vie

Coal differs essentially from peat and lignite in having its minute c either occupied with a gas instead of water, or so completely oblitera that nothing remains but carbon and a very small percentage of ash. Th are several different kinds of coal dependent on this condition. Th amongst lignite, it is not unusual to find black brittle bands like jet, jet itself is but another name for the same thing. The vegetable ma in this state contains much gas, takes fire readily, and burns like w steeped in resin, with a bright flame and smoke. It is clean, not soi the fingers, and is very brittle. It is the step intermediate between lig and coal, and when in sufficient quantity, and not too brittle, is o worked into ornaments under the name of jet. Some good examples, b of the raw and manufactured material, were exhibited by Messrs. Sa and Wright in Class 1, and were worthy of notice. Jet, however, has b too long known as an ornament, to require any especial notice, except connect it with coal as the substance with which it has the nearest relati

The next step in the progress of vegetation towards the mineral kingd is seen in cannel or parrot coal, which contains about 50 per cent. of vola matter; and, like jet, can be worked up into various ornaments, as exemplified by the beautiful specimen exhibited by H.R.H. the Pri Albert in Class 27. This was a garden chair, which well showed the nat and capabilities of the material, and a block of the raw material was pla



MODEL OF THE MONUMENT TO THE EARL OF DURHAM, IN CANNEL COAL.

near for comparison. In Class 1, was a model of the Durham monum and a number of smaller objects constructed of the same material.

But cannel coal is not only useful for ornamental purposes. It has a more important value in the very large quantity of common street gas can be obtained from it, and the excellent quality and great purity of gas. There are large deposits of this material in Scotland, where it been used for some time by the gas companies, but it has not long b employed to any great extent in London. Now, however, there is fo to be a supply obtainable from the Newcastle coal district, and this is exclusively by the Western Gaslight Company. There is also a la quantity used in London obtained from the Wigan coal field, where a th bed is being worked to very great advantage. Specimens of these kinds, (Russell's Newcastle and the Ince Hall Wigan cannel) were exhib amongst the general series of coal in Class 1.

Next to cannel coal, the common bituminous coal of Newcastle and o districts is the most remarkable for the quantity of gas it contains. the common household coal in most parts of England; and, as it takes readily, burns freely with considerable heat, has a cheerful appearance, is of moderate price, it is likely to retain its reputation. There are kinds of bituminous coal, the one swelling and becoming compact w burning, as the common caking coal obtained from the north; but other, although containing as much volatile matter, and therefore equ fit for gas-making, remaining unaltered in form while undergoing com tion. The non caking kinds come chiefly from the inland coal-fields, are easily distinguished from the others. Generally speaking, the disad tage of the Newcastle coal is that it requires constant stirring to kee draught of air through the fire; but, on the other hand, the heat give considerable; the ash is small and red, or at least, dark-coloured, and coal readily takes fire. The midland coals do not require stirring, but t burn with much fine white ash, and are not so profitable where strong l is needed.

Within the last year or two, very large quantities of coal have b brought to London by railroad, from various inland coal-fields, and estimation of the older and longer known kinds has undergone some cha but the general feeling still remains that the best Newcastle coal is best adapted for use amongst English families in London and its neighb hood.

When coal contains so small a proportion of gas and volatile ingredients, that it cannot be used with advantage in the manufacture of gas, it may still have a value for other purposes, which may render it very useful and important. This is the case with the kind called *steam coal*, rarely seen in London, but of which there were some noble examples in the Exhibition, and remarkable as making hardly any smoke, lighting readily, and burning with intense heat. The more important of these coals come from Wales, and contain upwards of 80 per cent. of carbon. They are especially useful for the steam navy, and are now employed for that purpose to an enormous extent. They are also most valuable in the manufacture of iron, as they stand the blast, and contain few or no noxious ingredients.

Anthracite is the name given to a peculiar kind of coal containing hardly any gas, and consisting almost entirely of pure carbon. It is very difficult to burn, but, when once fired, gives off intense heat, and stands a blast perfectly, being thus well adapted for stoves and for the manufacture of iron. It is heavier than common coal, often hard, and bright, and with a shining irregular surface. It exists abundantly in South Wales and North America, but occurs also in Ireland and on the continent of Europe. Besides iron smelting, it is especially adapted for malt-drying, hop-drying, lime-burning, and other purposes where smoke is injurious.

Of all those different kinds of mineral fuel, the Exhibition contained admirable examples, not only from our own country, so rich in this source of a nation's wealth, but also from distant countries, who have cared to show in what way they can enter into the field of rivalry with us. There cannot be a question that the foundation of our national importance is based upon the natural resources of this kind that we so abundantly possess, and it is both interesting and useful to see this recognised in the efforts that have been made to illustrate sufficiently the different districts most remarkable for their coal in our own island.

Of all these, the great district in Northumberland and Durham, which for a very long period has had the entire monopoly of the supply of coal to the east and south coast and many of the large towns of the interior of England, must be considered the first in the extent and scientific character of its workings, if not in magnitude. This tract occupies half a million of acres, and has been estimated to contain not less than ten thousand millions of tons of coal, of which, probably, an eighth part has been already removed. It was illustrated in the Exhibition by a considerable and interesting series of the different qualities of coal, the coke obtained from the coal, the clay in which the coal reposes, and which is valuable for various purposes in the arts; and also by the various maps, plans, and diagrams illustrative of the district, and mode of obtaining the coal. Several models were also exhibited which will render still more clear the method of obtaining this mineral from the bowels of the earth, and the contrivances necessary to supply a sufficient quantity of fresh air to the men employed underground.

The Lancashire coal-field is remarkable for its influence on the great manufacturing towns of Manchester, Bury, Wigan, and others; and the great Yorkshire coal-fields, on which are Leeds, Sheffield, Halifax, Bradford, Huddersfield, and many other large and important towns, were also illustrated by the specimens of produce referred to in this department.

From the Wigan coal-field, which is actively worked, and which supplies the cannel coal, already referred to as exhibited by the Ince Hall Company, we had also two kinds of household coal of excellent quality outside the building, and some samples in Class 1. On the Yorkshire side, coal was sent from Barnsley, illustrating very well the importance of the deposit and the nature of the supply. Several exhibitors sent from this locality, and the group was both interesting and useful for the purpose of comparison. Two columns of coal in the Building, and one outside, sufficiently showed the quality of this coal; while one exhibitor erected a column of a peculiar variety, sometimes called "peacock" coal, which presented a display of colours more like the tarnish of some metals than the ordinary dark and gloomy surface of coal. Whilst speaking of the coal of this district, we ought not to omit mention of the Stavely block of coal, from a mine near Chesterfield. The block was estimated to weigh not less than 24 tons.

The South Staffordshire coal field, containing one seam or bed not less than 30 feet thick, was also abundantly illustrated in the collection. In the western inclosure (outside) was a column showing this vast thickness in the way in which it is presented in nature; and the magnitude of the mass was also further illustrated by two blocks, one weighing nearly 10 tons, and another 15 tons—one exhibited by Mr. Round, and the other by Mr. Haynes; the latter being interesting in reference to the vast mechanical power required constantly in a large colliery, as this single block, weighing, as we have said, 15 tons, was actually removed from the bed of coal, conveyed to the pit bottom, lifted to the surface, and deposited on a truck by the machinery in daily use at the mine, and without any special contrivance or extra force.

The South Welsh coal-field is that which contains the greater part of the steam coal and anthracite found in the British islands, and was well illustrated by several varieties of each exhibited on a large scale. It has been estimated that the district occupied by coal in Glamorganshire and neighbouring counties must contain nearly a hundred thousand millions of tons—a quantity so large that it is hardly possible to imagine any consumption that shall seriously affect it within any time that man can look forward to.

The steam coals described as "Russell's," "Risca," "Nixon's Merthyr," "Powell's Duffryn," "Llangennach," and some others of which there were specimens, are all well known, and greatly employed in our steam navy in different parts of the world. Many beautiful and valuable anthracites were also to be seen, some presenting a peculiar polish, and others remarkable for their want of smoothness and fissures; but all of good quality, and capable of wide application.

There were several specimens of coal from North Wales. The most remarkable of these were the gigantic block, exhibited by Mr. Ockeley, and said to weigh 16 tons; another large block of 12 tons, from the [illegible] Company. Both were fine specimens and illustrative of the Flintshire coal-field, which, however, may be regarded as a portion of the Lancashire, though obscured and covered up by a very great thickness of the new red sand-stone.

There were some specimens illustrating both the Scotch and Irish coal; amongst them the parrot coal already alluded to. We may also refer to an interesting series illustrative of the coal-field of Mid-Lothian, exhibited by Mr. Cadell; and some Irish coals, though in less variety than might have been hoped. Lastly, we may mention the anthracite or culm obtained from Bideford, in North Devon, which was exhibited together with some of the products obtained from it.

Amongst the foreign coals the Belgian series afforded the principal point of interest, not so much for the extent of the coal field as the great relative importance of the production. The coal area does not include much more than a quarter of a million of acres, but the annual production is at least five millions of tons, exceeding, therefore, that of any other country in the world except Great Britain. The specimens of coal sent for exhibition were interesting, and of fair size for comparison with our own, but did not, of course, present the thickness of the bed, or sufficient dimensions to observe the peculiarities of the different parts near the floor or roof of the mine.

Next to Belgium, Austria sent the most interesting series of fossil fuel, but the variety was not very considerable. The States of the Zollverein and the Peninsula (Spain and Portugal) contributed a small but uninteresting quota, while France and the United States also added to the store. In these countries, however, the coal itself not occupying the important position that it does with us, as the source of all wealth, was not forwarded in large quantities, or in great variety; and the same must be said with regard to our Indian possessions, which, however, possess several deposits. From New Zealand and Van Dieman's Land were specimens, and also from Western Australia and some of the islands of the Indian Archipelago; but it is remarkable that the Newcastle of the southern hemisphere, though rivalling our own coal metropolis, not only by assuming its name, but supplying for New South Wales a considerable quantity of fuel, did not send any sample to represent it in the great gathering of raw material we are now studying.

Besides the natural fuel in the shape of coal, we observed, chiefly on the British side, a number of samples of artificial fuel, of which the best kinds are made from coal-dust, and partly charred. These compositions are valuable, as giving fuel of great density and high power in a comparatively small space, and will be valued accordingly wherever space is an object. They are generally constructed of the fine powder of coal and the smaller lumps, which are otherwise of little value.

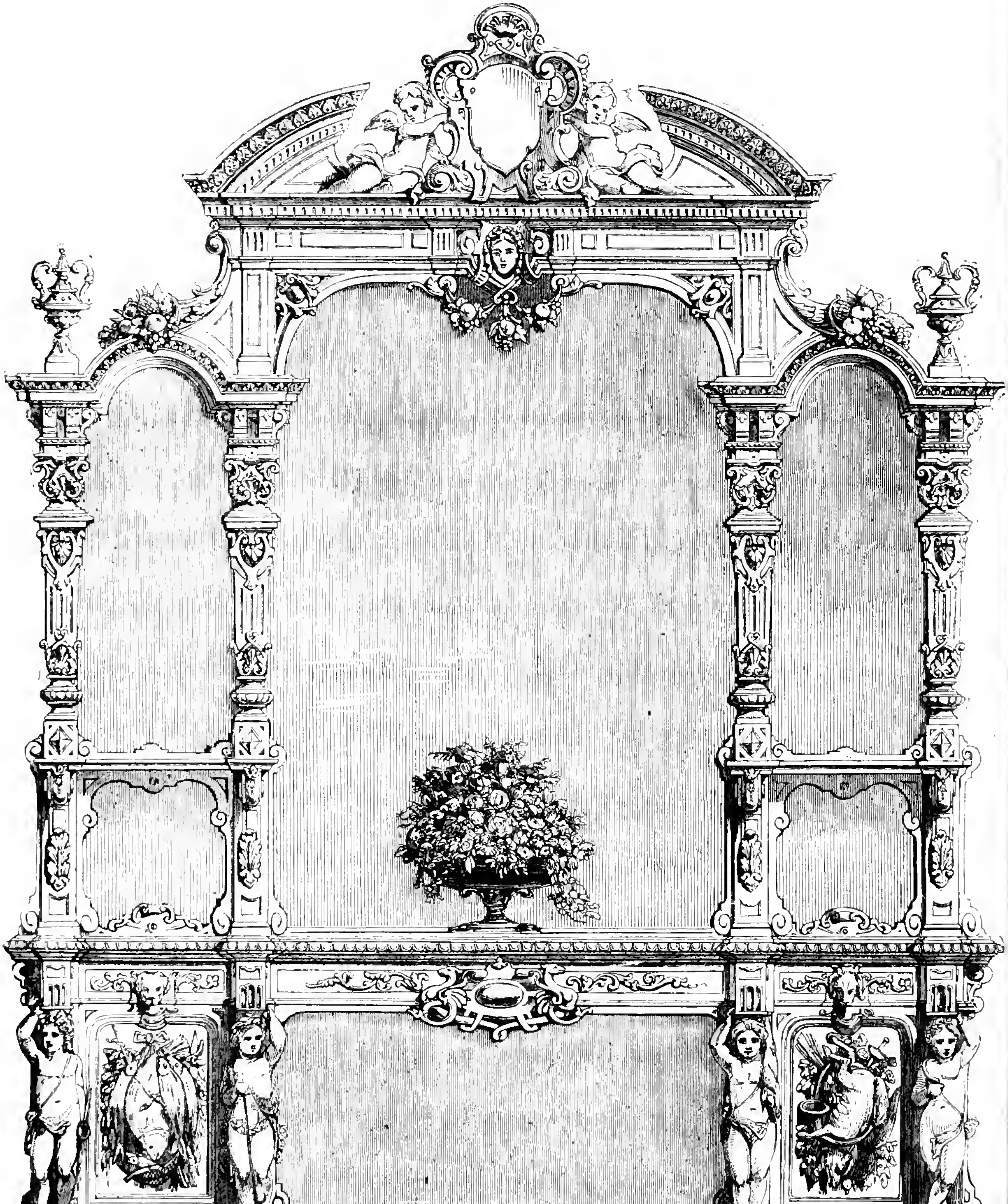
In concluding these remarks on the subject of Mineral Fuel, we take advantage of what has been said on the subject in the bulletin of the Central Commission of Statistics in the kingdom of Belgium:—

This is essentially the age of commerce and steam, the foundations of which are our *coal-mines*. Thus coal produces steam; steam fashions the metals which serve to fabricate machines. The implements of various trades, leaving the workshops, are distributed through every branch of industry. Steam becomes the universal agent; if she is the producer, she is at the same time the vehicle of production.

The powers of man are centupled: he is no longer the serf of creation: he is rather the King. The barons of feudality have made room by their side for the nobility produced by industry. The sword commands no more: it is capital which commands. To the state of strife, of warlike antagonism, succeeds a *régime* of industrial competition, and of exchange. Men know themselves and each other better: national characteristics are obliterated; it seems that humanity is invested with a new form: organisation is established between states and between continents.

Mineral and metallurgic industry is, with agriculture, the most vital element of a country's prosperity. Coal is the most essential agent of all industry: the foundry, the iron, constitute merely the instruments, the elements of riches.

AMERICAN EXHIBITION OF INDUSTRY.—Our transatlantic neighbours have publicly announced their intention to get up an Exhibition of Industry next year at New York. A company has, it appears, been formed in America which is represented in this country by M. Charles Buschek, Austrian commissioner for the Exhibition of 1851, and Mr. Edward Riddle, commissioner for the United States, to whom the whole management of the design has been confided. A large building is about to be erected, which, when completed, will be considered as a bonded warehouse. The contributions from England are to be conveyed in first-class vessels, free of expense, and if they remain unsold will be returned to the exhibitors without cost. This arrangement cannot but be considered as extremely liberal. There can be no doubt of the success of such an enterprise if carried out by a body of trustworthy persons. We hear of several English firms as likely to accept the friendly invitation thus held out to them.



SIDE-BOARD.—JACKSON & GRAHAM.

There were few articles of furniture in the Great Exhibition, whether on the British or Foreign side, which were entitled to higher honours than this sideboard of British oak, produced by Messrs. Jackson and Graham, of Oxford Street. It was not of those excessive dimensions which we had to complain of in many others, nor so overloaded with structural decoration as to fatigue the eye, and involve the imagination in laborious speculatic as to the intentions of the designer. The style was after that calle *Rénaissance*; the devices on the panels represented fishing and shootin whilst the four little figures were respectively emblematic of hunting ar fishing, summer and autumn.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

MINING AND METALLURGY.

IRON MANUFACTURES.

(SECOND NOTICE.)

THIS section was one of the most extensive, as it was also one of the most miscellaneous, in the English department of the Exhibition. The present has been called the iron age, and really there are few things, whether for use or ornament, which, in this country, are not now manufactured in iron or some other metal.

A very cursory glance at the catalogue, under the sections of cutlery and general hardware, will show the almost infinite variety of form and purpose to which, by the ingenuity of our manufacturers, the resources of the mineral kingdom have been made available. Commencing our observations with the conversion of pig-iron into bars and other convenient forms, it may not be uninteresting briefly to describe the processes to which it is submitted.

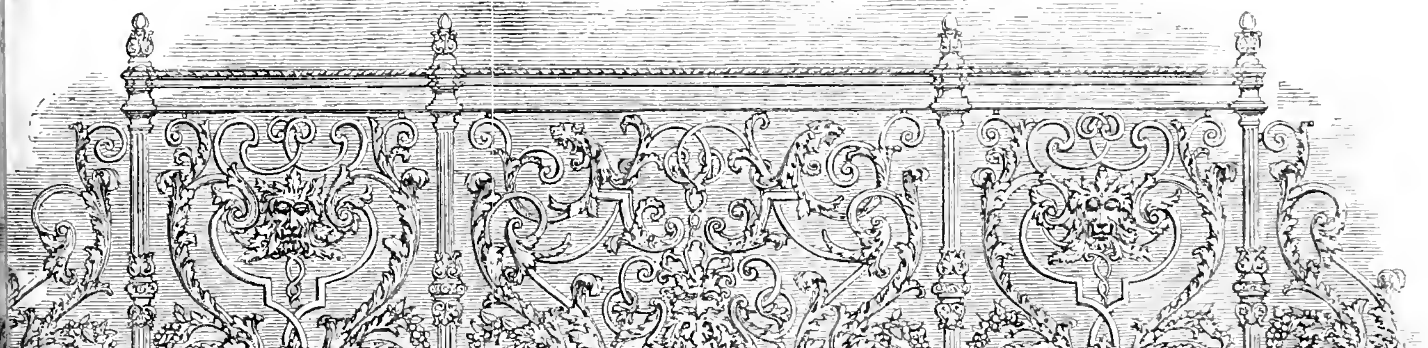
The machines adopted for forging and condensing wrought-iron vary in form and in principle according to the ideas of the iron-master. The tilt-hammer—of which examples were to be found among the machinery in motion—is most commonly employed. The steam-hammer of which Mr. Nasmyth exhibited his construction, is, however, increasing in use. The "blooms," as they are called, are brought under the hammer, and while at a red heat, beaten out into bars. These hammers strike on the "bloom" placed on the anvil, giving from 70 to 140 blows per minute, and the force of the blow is according to the square space of that described by the hammer. If the hammer lifted ten inches gives a force of 1000 pounds, it will, when lifted twenty inches, strike with a force of 4000 pounds.

Other means of forging iron are sometimes adopted, such as squeezers and rollers; but the hammer is usually regarded as a test of good metal. The hammer breaks badly worked iron more readily than any other machine—in the charcoal forge it smashes raw iron, and in the "puddling" works it crumbles those balls which have been carelessly put together.

Railroad bars, which may be regarded as fair examples of the manufacture of good bar-iron, were numerously exhibited. The Butterley Company had many examples in the mineral department on the south side. Messrs. Bird and Co. had amongst their extensive collection of iron manufactures, specimens of the Pentwyn rails. The Ebbw Vale Company, both here and in the department devoted to machinery in motion, had

CAST-IRON FOUNTAIN.—ANDRE, OF PARIS.—(SEE PAGE 199.)

many sectional specimens of railway bars; and we found also similar examples from the firm of Messrs. Beecroft, Butler, and Co. Mr. Morris Sterling exhibited his hardened top for rails. In the locomotive engine



CAST-IRON BALUSTRADE.—BAILY AND SONS.—(SEE PAGE 199.)

department, and in the machinery rooms, some very remarkable illustrations of this form of iron manufacture were found. Many railway bars which were exhibited were of an unusual length. There is no advantage gained by this; on the contrary, the liability of failing is increased by the accumulated difficulties of the manufacture. Almost every different railway engineer adopts a different length and section for his bars, and a different weight of metal per yard.

Coarse porous iron does not make good bars, as they are liable to split; it is, therefore, important to secure for rails a tough and fibrous material. Among the examples named were many bars broken for the purpose of showing their molecular structure, and the same occurred with some of the axles for railway carriages, which were included in the iron series. It has been stated that by continued vibration the character of the iron is changed, and that, from being of a fibrous structure, it often becomes crystalline. This is, however, notwithstanding the experiments which have been made on the subject, exceedingly doubtful. Mr. Brunel has shown that iron broken by a dull, heavy blow, will present the fibrous arrangement; whereas the same iron broken by a sharp blow will give a crystalline fracture. Certain it is, however, that, by the repeated hammering which is used in the process of "cold swaging," the character of the metal does undergo a change. In the report of the Commissioners appointed to inquire into the application of iron to railway structures, much valuable information on this subject has been collected.

A subject demanding important consideration is the action of mixtures of other metals with iron—such as those we find adopted by Mr. Morries Stirling, and the combination of wrought iron and cast iron, of which variety this gentleman showed two or three pigs, together with many examples of his alloys. Mr. Stirling considers the fluidity of Berlin iron to be due to arsenic—though it is as probably the result of phosphorus; and he has shown that the presence of manganese with cast iron closes the grain, and is an improvement both to it and to steel. Zinc and tin have been by the same experiments mixed with iron, and these alloys are amongst the other specimens of interest exhibited by this gentleman.

By the addition of calamine to common iron, without the addition of wrought iron, a very superior malleable iron is said to be produced. In the report of the Commissioners already referred to we find the average breaking strain of iron alloyed with zinc and with tin, as compared with pure iron, given as follows, the experiments having been made in Woolwich Dockyard:—

	Tons.
Dundyvan best bar iron broke with a strain per square inch of . . .	24·33
Dundyvan iron, in the proportion of 4 cwt. 1 qr. and calamine 4 lbs.	25·86
Dundyvan iron, 4 cwt. 1 qr., tin 1 lb.	23·39

On the character of these and some other alloys, Mr. Morries Stirling, in a paper recently read before the Royal Society of Edinburgh, remarks:—

"The wrought iron made either from the toughened cast, or by the admixture of calamine, is particularly useful for tension rods, chain cables, &c. The addition of antimony and some other metals to wrought iron in the puddling furnace, gives a hard and crystalline iron, nearly allied to steel in some of its properties, and is adapted, from its hardness and crystalline character, to form the upper part of railway rails and the outer surface of wheels. When thus united to the iron containing zinc, the best sort of rail results, combining strength, stiffness, and hardness with anti-laminating properties, and being also cheaper than any other kind of hardened rail or tire. Compounds of copper, iron, and zinc are found to be much closer in texture, and stronger than similar compounds of copper and zinc (the proportion of iron not usually exceeding 1½ per cent), and can be advantageously used as substitutes for gun-metal, under all circumstances, for great guns, screws, propellers, mill brasses, and railway bearings; small additions of tin and other metals alter the character of these compounds, and render them extremely manageable as regards hardness and stiffness. The advantages which these compounds possess over gun-metal are cheapness and increased strength, being about one-fourth cheaper and one-half stronger, and wearing much longer under friction. On many railways the alloy of zinc, iron, copper, tin, &c., have superseded gun-metal for carriage bearings. An alloy equal in tone to bell-metal—cheaper, and at the same time stronger—is made from the alloy of copper, zinc, and iron, a certain proportion of tin being added. The addition of iron seems, under most, if not all circumstances, to alter the texture of metallic alloys, rendering it closer, and the alloys, therefore, more susceptible of a high polish, and less liable to corrosion. Other alloys of iron were exhibited, some showing the extreme closeness of texture, others possessing very great hardness, and suitable for tools, cutting instruments, &c., others possessing a high degree of sonorousness."

A bell upon the stand in class 1, and another connected with Mr. Dent's clock in the main avenue, were examples of these alloys; the tone of them was very fine, and the cost was stated as being less than half that of bell-metal. The fine musical tone of these bells certainly recommends them to attention.

The British gold, as it is termed, in Mr. Stirling's case, is an alloy of iron, copper, zinc, manganese, and nickel; and in other proportions, the white metal is also produced; the advantages are stated to be—increased brilliancy of colour, closeness of texture, and freedom from tarnish. These qualities are highly important, and it is to be hoped, since attention has been directed by this exhibitor to the advantages derivable from alloying iron with small quantities of the other metals, that experiments will be repeated on these points for the purpose of ensuring the best results obtainable from these or other combinations. On the table devoted by Messrs. Bird and Co., to the display of iron manufacture, was a remarkable example of bar-iron—the largest perhaps ever rolled—with numerous other specimens which illustrate more fully our iron manufacture, and the use of sheet-iron in tin-plate manufacture.

The making of *Sheet Iron* is full of difficulties, the principal one being that of procuring iron of sufficiently good quality for rolling. Charcoal iron works better than most other kinds. Clear white fibrous iron is required; and in the first instance this is converted into flat mill bars, which are gradually reduced by being passed through rollers, until the required degree of firmness is obtained. This was well illustrated in the examples referred to. An examination of the iron exhibited in this department in sheets, and of that in the Russian department, showed the superiority of the latter. This depends, without doubt, upon the character of the ore in the first place, and on the mode of manufacture in the second.

The Russian sheet-iron is of a bright light-blue colour. This appears to arise from the presence of some phosphorus and silica in the ore, and from the admixture of a small quantity of carbon, which it derives from the fuel—wood—used in the process of manufacture. Sulphur, when present either in the ore or in the fuel employed, gives rise to a dark-black iron, and the sheets have a cloudy and buckled appearance. Although we may not employ ores containing phosphorus, we are now enabled, since the discovery of an almost incombustible phosphorus, to introduce it in any quantity into the iron in the progress of manufacture and thus to obtain, in all probability, the same result. There is no doubt that, with a due amount of attention to the combination of ores in the production of the metal, together with careful manipulation in the subsequent stages of manufacture, sheet-iron equal to the Russian could be produced in this country.

Messrs. Morewood and Rogers exhibited some remarkable large sheets of iron tinned by their process, to which, however, as well as to the subject of tin-plate manufacture, we must return on a future occasion.

We may add that in this class M. Felix Abate showed a system of planing, polishing, and burnishing, in a peculiar style, metals of every description, as they come from the rollers, and also a new style of ornamentation on the metals after they have been submitted to this process. The effects are obtained almost simultaneously, and at a cost so low as to exceed but by a mere trifle the original cost of the metal. The instrument employed in the planing process is a remarkably simple one, consisting merely of a cutting instrument, placed at a certain angle of inclination above a sliding table; and the ornamentation is produced by the substitution, for the plain cutting tool, of one with teeth, of the required form or design. The polishing and burnishing is produced in a few minutes by causing a cylinder to revolve rapidly over the metal, upon which oil and emery powder have been previously placed. A second portion of the invention of M. Abate consists of a new system of printing on metals, which he terms "metallography," the principle of which is an application of the known laws of electricity, developed by the contact of certain metals with the saline solutions of others, and producing, under certain conditions, the precipitation of the metal forming the basis of the solution in a state of coloured oxide, which adheres to the surface of the metal. Specimens of this art, which have been submitted to us, are remarkably good; and one of the benefits likely to result from the invention is that of placing within the reach of the poorer classes such improvements in objects of every-day use as may tend to elevate their tastes, and to create a love for the beautiful.

ORNAMENTAL IRON-WORK.

In ornamental iron-casting—a branch of trade to which our French neighbours have of late years devoted especial attention in connexion with their bronze works—there was some fear that in certain points we should not stand so well as it was desirable we should do. The result, however, of the comparison is such as to set at rest any fears on this head; for, whilst we can well afford to acknowledge the excellence of the works exhibited by our French and German competitors, there is ample field for congratulation as to the continuance of our traditionary superiority in these points. For this result, however, we have to thank the last two expositions at Paris; for, at the period of that of 1844, the ornamental iron-castings produced in this country were generally of a most unsatisfactory character; and it was only from the startling fact forcing itself upon the attention of those engaged in this trade, that, whilst little or no improvement had been going on in this country, especially as regarded design as applied to this department of our national industry, our neighbours had not only been employing the best artistic talent in the production of designs for this special purpose, but had progressed in a wonderful manner in the production of iron-castings of the very best character, combining the best mechanical dexterity and, so to speak, chemical skill in the treatment of the material, so as to insure a sharp, clear, and perfect reproduction of the model in the finished metal.

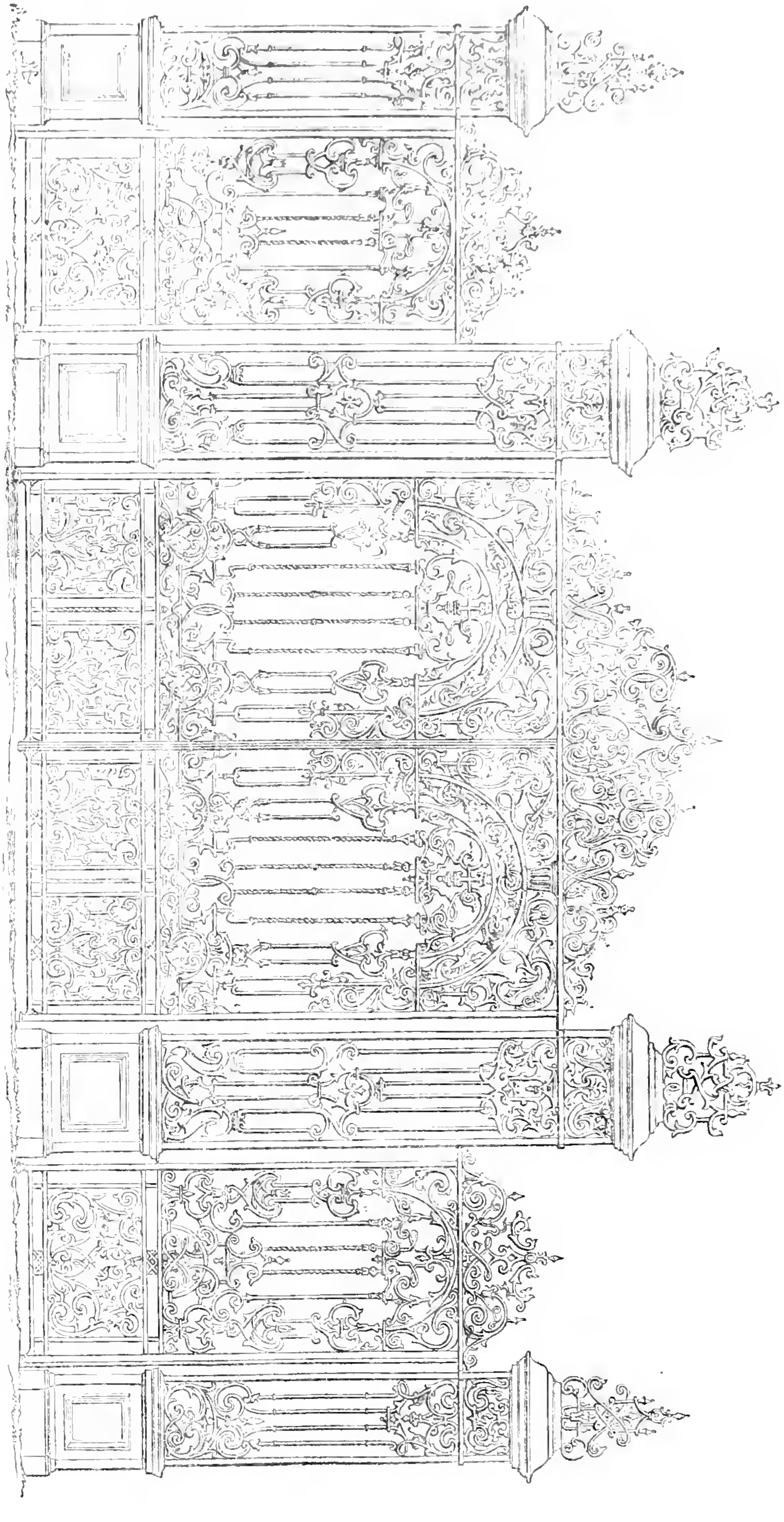
The famous castings of Berlin had long been objects of interest to our metal-workers, but only so far as they were wonderful examples of the use to which a material so unpromising as iron might be put, even as ornaments for the decoration of the person. The iron-castings of France, however, came more practically home to us; and when we found that the useful

was so completely combined with the ornamental, it behoved us to take steps to meet so unexpected a result. With a field of operation before us, of which the French could not boast, in those centres of attraction, the firesides of our English homes, it was at once seen to what an extent the improvement of our metal casting could be carried in this direction alone; and in the great Exhibition there were remarkable proofs of how distinctly our manufacturers have directed their attention to the decoration of the useful rather than to the production of mere ornamental accessories, such as groups of figures, statuettes, or even vases.

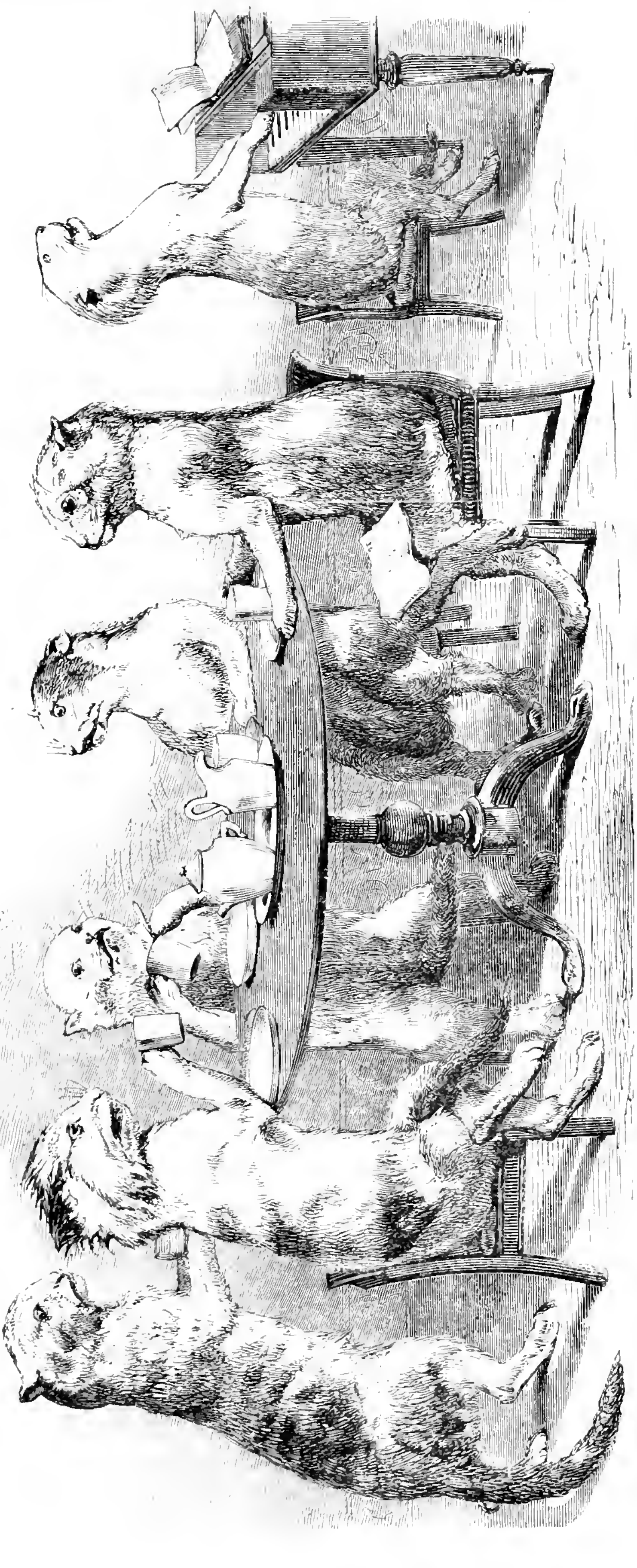
It is, then, to the stoves, grates, balustrades, garden seats, and other utilities, that we are to look for the real manifestation of the present position of the art of ornamental iron casting in Britain, and not to any mere abstract productions, although there are, without doubt, many excellent examples of this latter class of objects.

Let any one carefully examine the grates and chimney-pieces exhibited by Messrs. Hoole, Robson, and Hoole, of Sheffield, in which are combined an amount of excellence in design, with beauty of workmanship, far beyond anything which a few years ago could have been expected. The examples of dead polish steel, combined with bright steel and ormolu, exhibited by this house, show, in design, an adaptation of tasteful classic forms in new combinations and singular appropriateness of arrangement.

Messrs. Stuart and Smith's examples were equally excellent and original, though different in style, for which, indeed, we ought to be grateful; for in nothing do we need more improvement than in that everlasting "follow my leader" habit which seems so inherent in some of our manufacturers. For too frequently it is found that the instant an enterprising tradesman brings out a novelty, all "the trade" are after him in full cry, until his improvement is ground to pieces by continual repetition in all possible forms. Happily this is not the case on this occasion, for every man appears to have gone for a distinct individuality, and has consequently succeeded in a greater or less degree. Messrs. Yates, Haywood, and Co., Rotherham, also made a beautiful display in the avenue near the Sculpture-room; and, on considering the works of these three houses, we believe the reputation of Sheffield may be safely left in their keeping. At the same time, there are points in which improvement may be made, to the lessening of the cost of production and the consequent diffusion of a better class of manufacturing art amongst the people. For we hold that anything which tends to increase the price and not the excellence of a production is an evil; whilst anything which tends to reduce the price, and at the same time preserve excellence in all its integrity, is a corresponding good: therefore all superfluous elaborations, in whatever form they come, whether in the shape of "sham" bronzes, or the great integrity of ormolu, are to be deprecated: and that there are such elaborations about many of the most excellent specimens, will not be denied. Now, we hold that iron, being iron, should be left to look like itself. It gains nothing by paint and metal-dust. When seen in its own integrity of a rich brown black, or the beautiful grey of the dead polish, with the brightly polished portions by way of contrast, the effect is infinitely superior to any of the innumerable "shams" so constantly resorted to in order to make honest metal look like something else.



IRON PARK-GATES.—MESSRS. COTTAM AND HALLEN.—SEE PAGE 193.



GROUP OF STUFFED CATS, FROM WURTEMBERG.—(See Page 206.)

SKINS, FURS, AND FEATHERS.

(*Continued from page* 159.)

IN our former article on this subject, we gave some account of the specimens of furs obtained by the Hudson's Bay Company from the North American continent. We now propose to notice the European furs.

Foremost in interest among those was a group of Russian sables (*martes zibellina*). This is one of the most costly furs, a single skin varying in price from three to ten guineas. It is usually manufactured into linings, which are generally used as presents by the Emperor of Russia, the Sultan, and other great potentates, being of the value of 1000 guineas and upwards. They are also manufactured for ladies' and gentlemen's wear, according to the prevailing fashion of the country. The Lord Mayor, Aldermen, and Sheriffs of the city of London, have their robes and gowns furred with the sable, according to their respective ranks. The tail of the sable is also used in the manufacture of artists' pencils or brushes, being superior to all others. The tail of the sable makes very beautiful trimmings, which, together with muffs and boas of the same, are much prized. Russia produces about 25,000 of these valuable and admired skins annually. Naturalists have not yet decided whether this species is identical with that from North America—the fur of the former being much softer, finer, and longer than that of the latter.

The Stone Martin (*martes albogularis*), of which several groups were exhibited, is widely spread over Europe, and derives its name from the fact of the animal selecting rocks, ruined castles, &c., as its haunts. The fur in its natural state is soft and fine, and shades from a light to a dark-bluish grey, taking the colour of the rocks amongst which it is found The throat is invariably a pure white. The French excel in dyeing this fur, and it is in consequence termed French sable it is extensively used in this country and being a permanent colour, and much like the true sable, it is a great favourite

Several groups of Baum (or Tree) Martin (*martes abietum*) were also shown. This fur derives its name from the fact o the animal being invariably found in woods and pine forests The fur in its natural state is similar to the North Americar sable, but coarser. It is distinguished by the bright yellov colour of the throat: when dyed, it is so like the rea sable that it can scarcely be distinguished from it.

The groups of Ermine (*mustela erminæ*), in their natura state, next demand notice. The ermine is obtained in mos countries; but the best is from Russia, Sweden, and Norway The animal is killed in the winter, when the fur is pure whit (except the tail, with its jet black tip), it being in that seasoi in its greatest perfection; in summer and spring it is grey and of little or no value. It is the weasel of more southern climes. The ermine is the royal fur of most countries. In England, at the coronation of the sovereign, the minever, a the ermine is styled in heraldic language, is used, being powdered—that is, studded with black spots; the spots, or powdered bars, on the minever capes of the peers and peeresse being in rows, and the number of rows or bars denoting their various degrees of rank. The Sovereign and the members of the Royal family have the minever of the coronatio robes powdered all over, a black spot being inserted in abou every square inch of the fur. The crown is also adornec with a band of minever, with a single row of spots; the coronets of the peers and peeresses having a similar decoration The black spots are made of the skin of the black Astracar lamb. On State occasions, in the House of Lords, the peer are arrayed in their robes of State, of scarlet cloth and gol lace, with bars or rows of pure minever, more or less according to their degree of rank; the Sovereign alone wearing th royal minever, powdered all over. The judges in their robe of office are clad in scarlet and pure ermine. The ermine with the tail of the animal inserted therein, is used as article of dress for ladies, in every variety of form and shape, according to the dictates of fashion, and also as cloak linings. The minever can only be worn on State occasions by those who by their rank, are entitled to its use. In the reign of Edwarc the Third, furs of ermine were strictly forbidden to be worn by any but the Royal family; and its general use is prohibited in Austria at the present time. In mercantile transactions the ermine is always sold by the timber, which consists of forty skins. The minever fur of the olden time was taken from the white belly of the grey squirrel. The Kolinsk (*mustela Siberica*), or Tartar sable, is procured from Russia; it belongs to the weasel tribe, and is in colour a bright yellow It is much used in its natural state, and is also dyed to imitate the cheaper sables. The fur which is probably more extensively used in this country than any other is that of the squirrel (*sciurus*). The squirrel abounds in Russia (where the fur attains the greatest perfection) in such immense numbers

as would appear almost incredible the importation from thence to this country alone, last year, exceeding two millions. It is manufactured entirely for ladies' and children's wear: for cloak and mantle linings it is particularly suitable, its moderate cost adapting it to general use. The celebrated Weisenfels linings deserve a remark here, being made from the belly or white part of the dark blue squirrel. The exquisite workmanship and lightness of this article are without parallel, a full sized cloak-lining weighing only 25 ounces. This favourite commodity is known as the *petit gris*. For colder climates the linings are made from the back or plain grey part of the squirrel, the best having part of the tail left on each skin. The lighter colours have lately been dyed, and introduced to imitate the expensive sables. The squirrel tail is made into the round boa and trimmings, purposely for the foreign market; it is also used for artists' pencils. We find the squirrel named in the sumptuary laws, in the reign of Henry III., and at the same period the minever fur was the white part of the squirrel's belly. Russia produces about 23,000,000 annually.

The Fitch or Pole-cat (*putorius fœtidus*) is also so well known as to need but little description. About forty years since it was one of the most fashionable furs; the richness of its colour (the top hair a jet black, the ground a rich yellow), combined with its durability, caused a great consumption of this skin; but its peculiar odour, from which it was called the foulmarte, has probably been the cause of its gradual disuse. It is produced in the greatest perfection in this country.

Of lambskins there were various specimens, including those from Crimea, the Ukraine, Astracan, with Persian, Spanish, Hungarian, and English. The grey and black Russian lamb is mostly used for gentlemen's cloak and coat linings, for facings, collars, caps, &c., and also for army purposes. The Astracan lamb has a rich wavy, glossy, black skin, extremely short in the fur, having the appearance of beautiful watered silk: in order to obtain this choice skin, the parent sheep is destroyed a certain time before the birth of the lamb. The Persian grey and black lamb is covered with the minutest curls possible; this is not a natural growth, but is caused by the animal being, as soon as born, sewed up tightly in a leathern skin, which prevents the curl from expanding, and which is not removed till the desired curl is produced; from the means adopted, both sorts are rather costly, and they are used for gentlemen's wear and military purposes. The Hungarian lamb is produced in that country in immense numbers; the national coat, called the Juhasz Bunda, is made of it. In the summer or in wet weather the fur or woolly part is worn outside; in winter, when warmth is required, it is reversed. The skin is tanned or dressed in a way peculiar to the country, and decorated and embroidered in accordance with the means and taste of the wearer. In Spain, the lamb is used for the well-known and characteristic short jacket of that country, which is adorned with filagree silver buttons: the coarse kinds of both colours are used for our cavalry, and they are also employed for mounting and bordering skins, as leopards, tigers, &c., for ornamental and domestic purposes. In the reign of Richard II. the sergeant at law wore a robe furred inside with white lamb-skin and a cape of the same. The furs of the Perewaitzki and of the Hampster, which are obtained from Russia, are principally used by ladies; the latter is made into cloak linings, which are exceedingly light, durable, and cheap.

GROUP OF STUFFED FROGS, FROM WURTEMBERG.—(SEE PAGE 206.)

Passing from these, we next come to the skin of that well known and useful domestic animal, the cat. The cat, when properly attended to, and bred purposely for its skin, gives a most useful and durable fur. In Holland it is bred and kept in a confined state till the fur attains its greatest perfection, and it is fed entirely on fish. In other countries, and especially our own, it is produced in large numbers. The wild cat is much larger, and longer in the fur, and it is met with in extensive forests, particularly in Hungary; the colour is grey, spotted with black, and its softness and durability render it suitable for cloak and coat linings, for which purpose it is much used. The black species is also much in request, and is similarly used; and, with the spotted and striped varieties, it is made into wrappers for open carriages, sleigh coverings, and railway travelling. The value of this skin, and its extensive consumption, have, no doubt, been the cause of the disappearance of many a sleek and favourite "Tabby," and we would recommend those of our readers who are in possession of a pet of this description to keep careful watch and ward over it. We understand that the market is rapidly increasing, and the operation of the laws of supply and demand has led to the formation of an unprincipled class, who ruthlessly poach upon these domestic preserves.

We next come to the English rabbit, which yields a most valuable and extensively used fur—both in its wild and its domestic state; and the supply may be said to be inexhaustible. It was formerly employed to make the felt bodies, or foundation, of the beaver hat; but at present, not being used for that purpose, it is dressed, dyed, and manufactured in immense quantities into various useful cheap articles. The wool has recently been used in making a peculiar cloth, adapted for ladies' wear. The English silver grey rabbit was originally a breed peculiar to Lincolnshire, where great attention was paid to it. Warrens of this species have since been formed in various parts of the country. It is in great demand in China and Russia, to which countries it is largely exported, on account of the high price there obtained. The white Polish rabbit is a breed peculiar to that country, and the skin is there made into linings for ladies' cloaks, being the cheapest and most useful article available for that purpose. It is imported in great numbers into this country. The finer sorts of white rabbit are much used as substitutes for ermine; and when the real ermine tails are inserted therein, the imitation is so perfect that it requires the practised eye of the furrier to detect the imposition. So late as the reign of Henry the Eighth, great value was attached to the cony or rabbit skin, and the charter of the Skinners' Company shows that they were worn by nobles and gentlemen. Acts of Parliament were passed, regulating their sale and exportation, which are still unrepealed, though in abeyance.

HISTORY OF INDUSTRIAL EXHIBITIONS.

VI.—The Exhibitions of Spain.

Contrasted with the commercial condition of every other European state, Spain presents a doleful picture. A fecund soil, a genial climate, indigenous products of high commercial value belong to this brilliant country; but to Spaniards still cling the old barbarisms of government which every other civilised state has thrown aside. No well-ordered government has yet systematised Spanish industry—no man has yet risen to comprehend and develop the vast resources of Spain. "Spaniards," M. Ramon de la Sagra tells us, "in following out any branch of industry, are incited by immediately local wants, without regard to great productive capacity to be adapted to national and foreign markets. Surrounded by many hopeful fields of action, and strengthened by a noble love of perseverance and independence, they have launched into divers branches of trade—as a young man, stimulated by the vigour of his youth to use his strength, capriciously and hotly embraces various fields for action—from the mere necessity of action."

The traveller in Spain is struck with the apparent inactivity of the population. Although in Valencia and Barcelona various celebrated manufacturers still flourish, the general aspect of the Peninsula bears the impress of a disordered, ill-regulated social State. The vast monasteries, from which the lazy monks have retreated, may, in time, realise the hope that of design: already great factories are rising in various parts of the country, the whirr of the shuttle will replace the clatter of monastic feasts; but now, grass shoots in their courtyards, and the mildew thickens in their cells. Even the great and celebrated Bilboa carpet manufactory of Madrid is remarkable only for the history of its past: its vast galleries are almost deserted, and spiders have long been busy in the wrecks of its looms. Here and there only are a few workmen, whose handicraft still attests the excellence of their fallen industry, and serves as a sufficient reproach to a neglectful government. Heavy duties on raw material, and the consequent existence of a gigantic contraband trade, oppress Spanish manufacturers to such an extent that they are unable to dispose of their goods at any moderately-varying price—their value decreasing in a ratio with the increase of the contraband trade. The badness of Spanish roads, and the expense of conveying goods from the seat of manufacture to markets at a distance, are fetters which depress the industrial condition of Spaniards; but, inasmuch as all these depressing causes are removable, and as the rays of knowledge must soon reach to Madrid, in spite of ministerial opposition, it is not unreasonable to hope that the next twenty years will be years of hopeful progress in the commercial annals of the Peninsula. Already, in Barcelona, fifteen hundred pupils attend a public and gratuitous school.

The authorities of Spain have gathered together five national exhibitions of native industry. Of these the first was held in 1827, and had 297 exhibitors; the second in 1828, and had 320 exhibitors; the third, in 1831, and had 228 exhibitors; the fourth, in 1841, had 214 exhibitors; and the fifth, in 1845, and had 325 exhibitors. These numbers may be received as indicative of the manufacturing disadvantages under which the country has been and is labouring. The difficulty which the Madrid authorities have experienced in persuading even the manufacturers of the great centres of Spanish manufactures to send specimens of their skill to the capital is easily accounted for, when the expense of transit from distant provinces is coupled with the resolution of the government to pay only part of this expense. The relative proportions of space occupied by the various manufacturing provinces was one-third by Madrid, one-third by Andalusia, and one-third by Castile. At the exhibition of 1845, Madrid and Barcelona almost monopolised the space given up in the old Convent of the Trinity for exhibitors of Spanish industry. Bad roads, inefficient organisation, and a general conduct of public affairs quite at variance with that enlightened spirit which can alone make such displays of national service, have debased the industrial exhibitions of Madrid to an insignificance which the manufacturing advantages of the country make the more lamentable.

At these exhibitions many important branches of national manufacture have not found a place; and it was justly remarked at the exhibition of 1845, that a brilliant display might have been made of the products which it did not comprehend. The catalogue of this exhibition was sufficient evidence of the burden of the commercial laws. This document gave opposite each article its retail price, and the high figures, compared with those of other countries, showed that the Spanish manufacturer, with all the natural advantages of his country, could not hope to fight foreign manufacturers in the distant and scattered markets of the world. These high prices are the results of two distinct causes—the heavy duties on raw material, and the competition of a gigantic contraband trade.

In taking a glance at the general characteristics of Spanish exhibitions (but more particularly at that of 1845, as the most important of the five) it is easy to separate the great industries of the country from the minor but more showy branches of commercial activity. The conspicuous position accorded to silken, linen, and woollen goods, to leather and hides, printed papers, soaps, and iron, marked an appreciation on the part of the authorities of the special manufactures which Spain, by reason of her soil, climate, and geographical position, was justified in encouraging to the utmost. Most people at all conversant with the history of manufactures, would expect to find the woollen goods, manufactured from the fleece which France so long coveted, would be of rare excellence. But we are reminded by an eminent French manufacturer, who reported to his government on Spanish exhibitions,* that the fleece of Spanish flocks is one of her old glories. After a long and almost hopeless depression, woollen manufactures are again beginning to revive. The five exhibitions which are on record, however, included only a few fleeces sent from Seville. Specimens of cloth, of but indifferent texture, were sent from Catalonia, Segovia, and Alcoy, to the exhibition of 1845, and were marked at very high prices; and the commissioners from France, who visited the convent of the Trinity, sought in vain for some samples of Spanish undressed wool. Not one exhibitor of merino or mousseline-de-laine appeared, nor were the carpet manufactories of the country represented. Silken goods of excellent quality, however, were sent from Valencia and Barcelona, and some coarse specimens from Saragossa, the China crape shawls and blonds being the finest specimens of manufactured silk. The exhibition was destitute of gloves and hosiery. A few dear and coarse pieces of plush, for hats, only served to prove the depressed condition of the manufacturer.

The cotton manufactures of Spain, almost exclusively belonging to Catalonia, were represented at the exhibition by threads of various numbers (the highest of which was forty), calicoes, worked counterpanes, and printed goods. Of these varieties of cotton manufacture, the printed goods only claim any notice for excellence. These were distinguished by the brightness of their dyes, and the neatness of printing and design. They were all manufactured for immediate consumption.

Barcelona, at once the most advanced manufacturing locality in Spain, and the most vehement supporter of high protective duties in Spain, contributed the most valuable textile specimens seen in the exhibition, showing excellent samples of silk, flax, and cotton mixtures. The dearness of these goods, when compared with the prices of English and French manufactures, explained the anxiety of Catalonian manufacturers to protect themselves from foreign competition.

The exhibition included a few average samples of sound cordage and stout sail-cloth, but not one specimen of thread lace, or one piece of lawn. Printed papers occupied a great portion of the principal room. The chief seat of this manufacture is in Madrid, where labour is dear, and where, consequently, the product figures at a high price. The patterns shown were characterised as vulgar, and printed with bad colours.

Dressed leathers were also conspicuous in the exhibition. Morocco and kid, for gloves, were shown in abundance. This department of manufacturing industry showed a more marked vitality than any other. The leathers were strong, supple, and of excellent substance. The moroccos only lacked the brilliant dyes of Choisez-le-Roi to make them equal to any in the world; and the kid, which is manufactured in vast quantities, attested the superior excellence of Spain in this production to other countries.

In the department of glass manufactures a falling off from past excellence was clearly visible. The best specimens of glass came from the Royal manufactory of Saint Ildefonse; and these were coarse, ill-coloured, and, according to M. de la Mornaix, only worthy of a barbarous age. In earthenware and porcelain, a falling off was also lamentably visible. Only a few indifferent specimens of chemical products, as mineral salts, &c., were visible; but the exhibition was altogether destitute of alkalies and dyes, and minerals, and this in a country which possesses the richest lead, quicksilver, iron, and even silver mines of the south of Europe. A few bars of iron, a stray ingot or two of silver, cannot be accepted as representing the great works of M. Heredia in Malaga, the iron districts of Biscay, and the important wealth of Adra.

In goldsmiths' work and in gunsmiths' work, however, the exhibition showed signs of industrial progress, and proved that the excellences of the past, in matters of taste, were not quite forgotten. Some excellent specimens of clockwork were also exhibited.

Spanish manufacturers contributed nineteen pianos, all manufactured on the English model, and marked at ridiculously high prices—the commonest kind being valued at from fifty to eighty pounds sterling; and square instruments, dry and harsh in their tones, were expected to realise about two hundred pounds sterling. A few guitars necessarily formed part of a Spanish exhibition; and in the list of musical instruments exhibited on this occasion figured a violin on the old Stradivarius model, which is described as an instrument more curious to look at than agreeable to listen to.

Although there was not one specimen of Spanish printing exhibited, not a few excellent samples of bookbinding and lithography appeared. Cabinet-makers made but a poor appearance. The fame which the cabinet-makers of Spain have so long enjoyed, and proofs of the justice of which decorate the houses of Madrid, sent but few articles to the national exhibition. It would appear that in the resolution to establish periodical exhibitions of native industry, the Spanish authorities formed too high an estimate of their manufacturing countrymen's enlightenment. It is not to be expected that in a country where manufactures have been led to place their trust for commercial success in the strong arm of the law against foreign rivals, rather than in the excellence of their own productions, that they would hail the establishment of an institution which would lay bare to foreigners

* M. Sallandrouze de la Mornaix.

and to native rivals the inferiority of their accomplishments. It is probably in this light that the provincial manufacturers of Spain generally regarded the exhibition to which they were invited. At this exhibition, ostensibly national, neither the hemp and flax of the Asturias and the Basque provinces, the silk of Murcia, Estremadura, Castile, Arragon, and Andalusia, the fleeces which abound in every province of Spain, the cloths of Segovia, Guadalaxara, Brihuega, Valencia, and other important manufacturing towns, were to be seen. At this exhibition there were no specimens of steel, no cutlery, no sample from the locksmith. The welcome which Spaniards gave to the proposals of the Great Exhibition Commissioners, and the zeal with which they endeavoured to place their country in an honourable light among the nations represented in the Hyde Park Palace, justify, however, the hope that the new manufacturing energy which has been given to the industries of Spain, will at length vindicate this country in the eyes of the world, as one rich with promise, and teeming with an ungathered harvest of mineral and vegetable wealth. Everywhere manufacturing companies have been formed of late, in Barcelona, Malaga, Valencia, Grenada, Seville. Immense factories are rising in every part of Andalusia; and improvements are now being rapidly introduced into native agriculture. At the exhibition, as an instance of advance, some fine specimens of cochineal were shown—both prepared and in the natural state, crawling upon a leaf. The system of irrigation carried out of old by the Arabs, in the province of Valencia, and which makes this territory even at the present time one of the most fruitful parts of the country, should have attracted the notice of Spanish agriculturists long ago. So perfectly did the Arabs understand this great principle of agriculture, and so soundly did they carry it out, that their administration remains intact to the nineteenth century. Eight grand canals, from which others stretch, drain the vast extent of land, and the gentle slope of the surface towards the sea carries the water off rapidly. This system is governed by a rude tribunal, known as the Tribunal of the Waters. This body consists of five judges, elected by the proprietors of the soil benefited by the irrigation, and vested with special powers. These judges meet in the open air, at the door of the Cathedral of Valencia. Before them a rude bench is placed, at which those persons condemned to pay fines for the infraction of rules, or who have complaints to make, appear in person to plead in mitigation of the fine imposed, or to explain their grievance. The judges decide on the spot, and the execution of this sentence follows instantly, without right of appeal. No notes of the proceedings of this rude tribunal are taken, and the proprietary body submit to its decrees without a murmur. The Captain-General of the province places police at the disposal of this Arab institution, by the simple operation of which a valuable system has been preserved for ages, and sets apart his province from the rest of Spain as the *huerta*—the garden of the country. The exchange of Valencia presents a vivid picture of the wealth of the province, crowded with lightly-clad and barefooted peasantry, bearing their loads of silk, new from their fruitful patches of land. Here, where the egg ripens to the worm, is the old Arab proverb illustrated: on the spot where the clammy stream of silk oozes from the worm, the brilliant thread is woven into garments—the mulberry leaf is turned to satin.

Barcelona bids fair to be the Manchester of Spain. Here four great departments of industry are carried on, viz., the construction of machinery, and silk, woollen, and cotton manufactures. All the latest improvements in machinery and processes exist here, under the superintendence of Englishmen or Frenchmen. Spinning-jennies, looms, steam-engines, and other manufacturing powers, are constructed excellently on the spot. The cotton, silk, and woollen factories, chiefly of recent establishment, are constructed generally on a gigantic scale, and give employment to a large population. The factory hands of Barcelona are, however, ill-paid; and may be seen lounging about the factory yards at meal-times, eating the very coarsest kind of bread, and a few onions, oranges, or radishes, as their dinner. They labour thirteen hours daily.

The result of an inquiry into the commercial condition of Spain at the present would, most probably, result in the conclusion that her manufacturers, with every wish to profit by the ingenuity of foreigners, and to throw themselves into the markets of the world on honourable conditions, are, as yet, enslaved by hostile duties miscalled protective (since raw material—as coals, &c., are heavily taxed): that they will soon come in contact with their government and command more enlightened commercial laws; and that this meeting has been retarded up to this time only by the prejudice and narrow-mindedness which follow repeated national reverses, and the terrifying calamities of civil strife.

VII.—The Exhibitions of Germany.

The commercial history of Prussia since the Peace is too well known to the manufacturers of this country to need elaborate mention in a history of her industrial exhibitions. The gradual formation of that great commercial league which now binds Prussia, Bavaria, Wurtemburg, and other states of Northern Germany together, and gives them, commercially, one common interest, has so absorbed the attention of Europe throughout its progress, that its minutest details are familiar to all who have mingled in the world for the last thirty years. This great commercial confederation now indisputably ranks as the third commercial power of Europe, including vast agricultural and manufacturing resources. As a market for foreign manufactures, the states of the Zollverein are decreasing daily in value: and England, that, in 1813, inundated these provinces with the products of her looms, now [illegible] be notice[illegible] and [illegible] trated. Factories of [illegible] weaver of Saxony and [illegible] The cheapness of raw material [illegible] Prussia advantages [illegible] she yet needs the sagacity and experience to turn to full and profitable account. The most important commercial interest of the Zollverein consists incontestably in its wealth of wool and woollen manufactures. The cloths of Saxony, Silesia, and Prussia Proper command the markets of the East and the West, more, perhaps, from the excellence of their raw material than from any superiority in the skill of German weavers. The linens of Saxony and Westphalia have also an enviable reputation in the markets of the world: and in Berlin and Potsdam, silk manufacturers are making rapid progress: these manufactures have figured at the Berlin exhibitions in considerable quantities. These exhibitions, comprehending specimens of Bohemian glass manufactures, Berlin iron-work, the porcelain of Saxony, and the iron ores of Silesia, have undoubtedly stimulated manufacturers to make those enlightened exertions which have characterised the last ten years within the circle of the great commercial confederation.

The commercial policy of Austria, strictly and inexorably protective, presents a picture in direct contrast with those presented by the other countries whose industrial exhibitions we have noticed. Here corporations of trades and workmen are maintained with all the strictness which characterised those of France in the last and during the early part of the present century. All the great foundries and manufactories are government speculations; class is protected against class, and an impassable barrier of restrictive duties warns the foreign merchant from the Austrian soil. Yet even this country boasts its exhibitions of industry. Even here the principle of gathering together the products of the country for the instruction of the community has been recognised and acted upon. The great natural riches of Austria are remarkable. She has abundance of combustible fossils: the simple evaporation of the waters of the Hungarian lakes furnishes her with vast quantities of soda: her alums may compare with those of Rome: no country is richer in salts; and these immense natural resources are neglected through the ignorance of Austrian chemists. The beet-root sugar manufactories of Moravia and Silesia, and glass factories of Venice and Bohemia, claim notice in the most cursory review of Austrian industries. The products of the Bohemian workmen have made splendid shows at the Vienna exhibitions, and have been contributed by the busy population of Wisental, and the great establishments of Gablonz and Liebenau. Venice, however, has fallen, under Austrian domination, from her ancient splendour, and has sent little or nothing beyond a few mosaics to the capital of her conquerors, on these occasions. At the last Vienna exhibition, Austria showed signs of progress, in the specimens of machinery exhibited by the Great Southern Railway Company. That these exhibitions, including examples from the shawl, porcelain, and great silk factories of Vienna, the velvets of Milan, and the light silk goods of Como, should have attracted particular attention, and proved eminently successful, is not to be wondered at, since they displayed at a glance the industrial power of a great country, crippled by narrow national views, it is true, yet in its bondage giving proof of its giant capacities. Already educational associations have been founded; already the manufacturers of Vienna have established a society for the examination and encouragement of useful inventions; already a Tyrolese society for the formation of an agricultural and industrial museum has been established; already Trieste possesses a gratuitous school of art and a savings'-bank.

In a brief record of the industrial exhibitions of Germany, the efforts of the King of Bavaria—of that King who has so greatly adorned his capital—to establish permanent exhibitions of Bavarian skill, cannot be passed over. It was in 1845 that the first permanent building erected in any country for such a purpose was thrown open at Munich. The building is adorned with sculpture by Schwanthaler, and provides nearly two thousand square yards of exhibition space.

The continental states, of whose industrial exhibitions we have given a brief history, can by no means claim, exclusively, the honour of having recognised the utility of these institutions; since industrial exhibitions have been held at various times, and with varying success, also in Italy, Sweden and even Russia. Detailed accounts of these would, however, prove of little interest to the general reader, since they included, for the most part, only specimens which, however excellent, when considered as native products, could not, of course, enter into competition with the more advanced manufactures of Germany, France, Belgium, and England.

WORKS IN ORNAMENTAL IRON.

The group for a fountain, by André, in our front page, is very spirited: the design being both original and appropriate.

The ornamental balustrade, by Baily and Son, was one of the most perfect specimens of iron workmanship in the Exhibition: the design highly graceful, and not deficient in richness and variety: and the execution admirable for sharpness and finish, appearing, as we understand, exactly as it came from the mould.

The iron gates exhibited by Messrs. Cottam and Hallen, of Oxford-street, are fine specimens of ornamental gates for a park in the style of those elegantly-wrought iron-work, made about a hundred and a hundred and fifty years since, and which adorn the entrances to many of the old mansions of England. One great merit of these gates is, that they can be made at a reasonable rate as compared with the wrought iron-work.

ERARD'S PIANOFORTE AND HARPS.

MUSICAL INSTRUMENTS.

(SECOND NOTICE.)

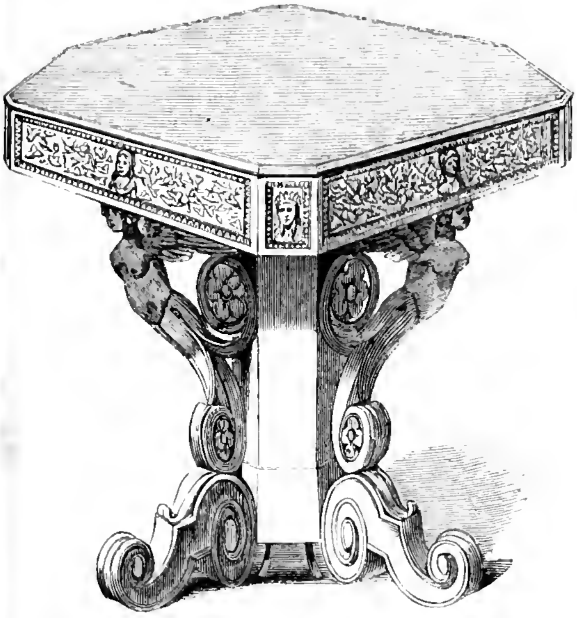
PIANO-FORTES.

WE resume our remarks on the Pianofortes in the Great Exhibition, and shal direct our attention to some of the beautiful and costly instruments exhibited, o which we now give a more detailed account. We shall however, offer no opinion o their comparative merits either of tone or mechanica construction (simply noticin that which is new or curious) as each leading manufacture has his peculiar variety of th former, and for the latter th widely spread reputation o the chief makers is a sufficien guarantee that their instru ments are constructed on th best principles, though ther may be some trifling differ ences of application partic lar to each.

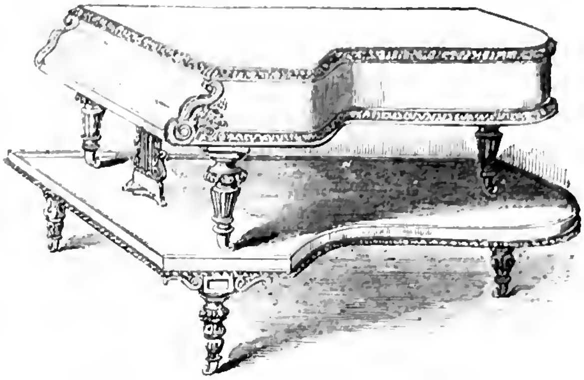
We notice, first, from th prominent position they oc cupied, the two magnificen grand pianos in the Nave the one in the English de partment, by Messrs. Broad wood, is a gorgeous-lookin instrument; the sides a shaped out and are of ebon covered with a running orn ment of scroll-work an figures, carved in relief an gilt; the top and front is el borately inlaid with sati wood, and the legs are ebony carved and gilt *en sui* altogether presenting a ric and imposing appearanc The grand of Erard on th foreign side, is a very chas and beautiful specimen of th French style of ornament cabinet-work. It is of tuli wood banded with panels elegant design, richly inla with gold, silver, and tortois shell, with ormolu mould ings, while the instrumen is supported by well-ex cuted figures in gilt meta springing from a stand of th same wood. As a piece elegant musical furniture is perfect in design and ex cution.

Returning to the Britis side in the gallery, we fin Mr. Wornum sent a piccol in walnut, and an Albio grand. We may remark, *en passant*, that it is to this gen tleman we are indebted fo the first introduction of th piccolo or small uprigh pianoforte, which, from it capability of being produce cheaply, has had considerabl influence in promoting ou manufacture of pianos, an indeed, extending a know ledge and taste for musi Messrs. Broadwood's thre grands are beautiful spec mens of amboyna and wa nut, and of that quiet an elegant style of cabinet-wor

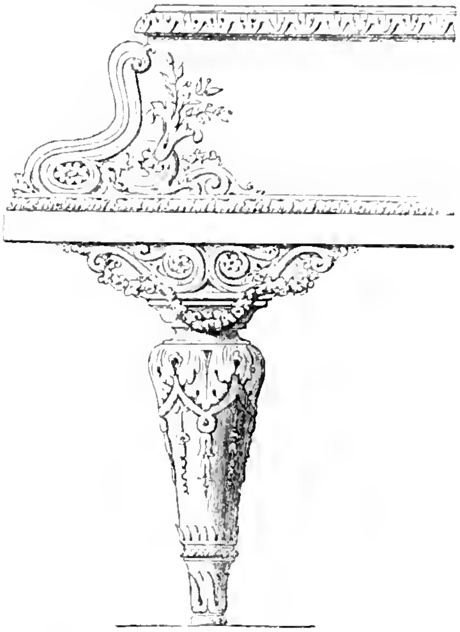
which is generally consonant to our English taste; and our manufacturers seem more desirous of availing themselves of the beauties of nature in the rich and varied figure of the different rare woods, than employing the designs of art. This may perhaps account for the comparative absence of buhl and marqueterie work in our pianofortes. Erard, again, exhibited two very handsome upright pianos, one richly carved in walnut in the Elizabethan style, and



PIANOFORTE.—PAPÉ, OF PARIS.

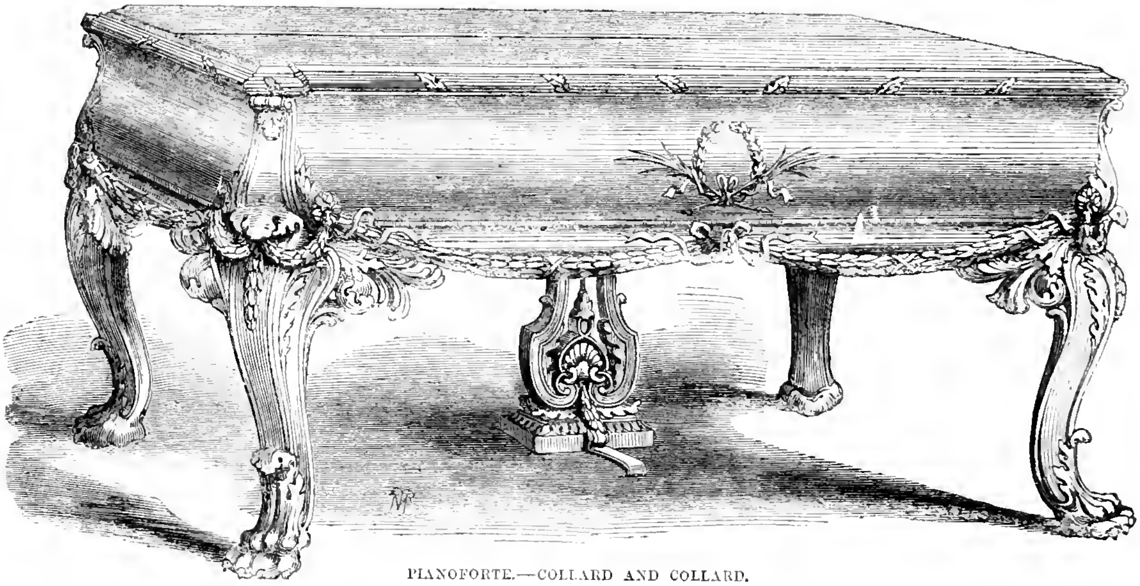


MINIATURE GRAND PIANOFORTE.—KIRKMAN.



END OF PIANOFORTE.—BROADWOOD.

the other in rosewood inlaid with silver and supported by eight carved legs. One of the most elegant instruments of the Exhibition was the grand by Messrs. Collard, in pollard oak, carved and gilt in the style of Louis XV. The design is well carried out, and in admirable keeping. The square in walnut, with shaped sides, is very massive and handsome. There was also a carved cabinet piano by the same firm, which we do not, however, much admire. The oblique pianoforte, in ebony and gold, in the Italian style, with well-designed carved frets, &c., by Messrs. Kirkman, is a graceful and elegant instrument. These makers also exhibited a perfect *bijou* of an instrument, designed to illustrate the effect of the moderm improvements in pianofortes—the smallest, to be played upon, ever made. It measures about 3 feet wide by 4 long, yet it has the full compass of $6\frac{3}{4}$ octaves, from C to G, and is on the upbearing principle throughout. It possesses all the modern improvements; the fulness and clearness of tone, the power and promptness of the mechanism, the elasticity of touch, and the close damping with the movement of the pedals, are marvellous when considered in reference to its tiny proportions. A few years back it would have been deemed totally impossible to make so small an instrument with the full compass of keys, to produce any effect; but the modern additions of metal string-plate and bracings, drilled metal bridges, and other improved methods of construction, has enabled it to be done; while the large amount of tone, considering the string is only twenty-four inches long, procured in the lower notes, is produced by a treble-spun string, composed of steel, soft iron, and copper wire, made by the aid of a machine recently invented. We next come to Messrs. Stodart, who exhibited a grand in rosewood and a compact square: the peculiarity in the latter instrument is, that the string and sounding-board are sunk in the case, and that the hammers are made to strike down upon the strings instead of up to them, as usual: it has a very good tone, and is a convenient instrument, having almost the appearance of a sofa table when shut. Mr. Cadby sent a grand and cottage, in zebra wood, with his patent suspended sounding-



PIANOFORTE.—COLLARD AND COLLARD.

board: there seems to be a great deal of machinery employed to effect this, and we cannot say that it is attended with any superior results, as a comparison with other instruments will attest; at the same time it has the disadvantage of increasing the bulk and expense of an instrument, both of which are already great enough. There was a curious-looking instrument in the Grand Exhibition, by M. Greiner, professing to be constructed on the principles of the speaking-trumpet, and with an application for tuning the unison at one operation. There is much ingenuity displayed in this construction, but we do not perceive the advantage to be gained by the tone issuing from the sides of the instrument: and although it would be very desirable to tune the unisons as a single string, as it would obviously save one-half the labour, we are afraid it is not so effectual, but that it requires regulating; and as one wire will always stretch more than another, a tuning-pin to each string seems preferable. This instrument being the first of the kind made, the inventor will, no doubt, improve upon it. Jenkins and Son exhibited a piano with a moveable front, especially adapted for cabins of ships and yachts, where space is an object. We observed an instrument in the French department, in which the same thing is effected but in a much neater manner, the unsightly pieces of iron at the side being dispensed with. Mr. Addison sent a transposing pianoforte, as also Messrs. Harwar and Towns, and Packer. Mr. Addison's principle is the most original, the others being on plans that have been adopted by different manufacturers for a long period. The carved cottage, in walnut, of Mr. Brinsmead is a very creditable piece of work and attracted much attention. Mr. Allason, and Messrs Oetzman and Plumb, also exhibit elegant cottage instruments in walnut: and Messrs. Ennever and Stedman, a walnut marqueterie cottage of excellent workmanship and design: the colours, however, do not harmonise nicely, and consequently it has a rather gaudy effect. The cottage pianoforte, the case work in papier mâché, by Messrs. Jennens and Bettridge, is a novel adaptation of this class of ornament, and is exceedingly showy. The instrument is by Mr. Dimoline, of Bristol. Mr. Hopkinson exhibited a grand pianoforte, to which is applied his repetition action recently patented. Messrs. Rolfe, Mott, Luff, Metzler, Southwell and others also contributed samples of their respective manufacture; and, taken as a whole, the display of pianofortes from this country fully bears out our superiority in this branch of manufacture.

We now pass over to the pianos exhibited in the Foreign Department. From Vienna we had a beautiful cottage, with buhl-work of excellent workmanship and design, with ormoulu figures on each side. (This instrument was placed in the Austrian room, and a grand, in American maple, with a border of wood mosaic, which was in the Gallery.) The other instrument from Germany, of which there were a considerable number, presented nothing remarkable in appearance and construction. Belgium sent a number of pianos, principally of the upright kind; but as they were mostly on the French model, and displayed nothing very elegant in their decoration, we need not enlarge upon them. On entering the French Department, the admirers of buhl and ormolu work found some elaborate specimens. We may mention those of M. Montal, who also sent an elegant cottage, in tulip wood and marqueterie, with transposition mechanism; and that of M. Van Overbergh, which were exceedingly rich and tasteful. This instrument has a double sounding-board; but it does not seem to possess more tone than those constructed in the ordinary manner. Erard, besides his grand in the Nave, sent more harps, and five other pianos, ordinary enough in their appearance. We cannot perceive the utility of thus exhibiting duplicates of the same article, while in the warehouses of any of our principal manufacturers dozens of instruments could be found very superior in appearance; but we are glad our great English makers have taken a higher view of the matter, being content to be adequately represented without converting the Exhibition Building into a vast warehouse for their every-day productions. M. Hertz exhibited an organ-piano, a grand and semi-grand. M. Pape, who sent specimens of his console pianos, is known to be one of the most scientific makers in Paris, having laboured for many years in the improvement of the instrument. He has introduced several inventions, some of which have been adopted in this country. MM. Rollet and Blanchet exhibited oblique and vertical pianos, some being transposers.

The self-acting piano of M. Debain is very ingenious, and is one of the best things of this kind we have seen. It has the great advantage of economy of space, and very perfect execution. We noticed two pianos (No. 475) by an association of workmen; one is in marqueterie, rather pretty. The tone of the French pianofortes, with which many of our readers are doubtless acquainted, is very distinct from the English. It is shorter, more *frappant* and piercing, requiring much greater force of finger to bring out; and this character of tone, with the stiffness of the touch, may account for the inclination to force or "thrash" the instrument sometimes observable in the foreign pianists, who, from being accustomed to these instruments, are scarcely prepared for the self-sustaining tones of our English pianos, with their light and delicate touch. As a general rule, foreign pianos are not admired in this country: and we must ourselves give our own the preference, as possessing sweeter and more musical tones.

We now proceed to notice the American contributions. They show a higher state of excellence and finish in pianofortes than in many other manufactures, which may be traced to the high price they obtain for their instruments, which enables them to employ first-rate workmen, and from their having no foreign competitors: for it is a singular fact, that while we export pianos to India, South America, Australia, Spain, and other parts of the world, our own instruments will not resist the dry climate of the United States, though we could supply them with a cheaper, and, in m cases, a better instrument than they can manufacture. It appears the w requires seasoning in their country; but we cannot help thinking, attention on the part of our manufacturers to the causes which produc might enable them to conquer this difficulty. The American m facturers excel in grand squares: and their instruments of this class advantageously compare with the best of our own make. Their grands by no means inferior, though not equal to ours. We have specimen squares, from Nunn and Clarke, and Meyer; and of grands and squa from Chickering, Pierson, &c. The square by Nunn and Clarke is a n instrument of its class. We have a novelty in this department in "Piano-Violino," invented by Mr. J. S. Wood, of Virginia. This is a ingenious and curious instrument; a kind of treadle at the bottom of piano, near the pedals, sets in motion four bows, which pass over strings of a violin placed at the back: when in motion, the keys of piano, when played on, depress these bows, which work in a groov guide them, and produce the corresponding note on the violin. On struck with the novelty of the most difficult of musical instruments b played mechanically: but there is a monotony in tone, from the wan expression, common to all contrivances of this sort (and in this ag mechanical appliances it is well for art that it is so): and were invention brought to the greatest perfection, it would at best be imitation of an indifferent performer: at present it is imperfect.

It may be worthy of observation, in relation to pianofortes at Exhibition, that Italy, the country in which the pianoforte was first vented (it having been first made in Florence, or, at any rate, the piano brought to this country came from Rome), does not contribu single instrument, while we have pianos from St. Petersburgh and Can Thus the very invention Italy gave birth to has been reared and bro to perfection by the more vigorous industry of other countries.

ORGANS.

The Organ has been called, not inaptly, the King of Instruments. other instruments are made; the organ is *built;* and its gigantic bu attended with corresponding power. In the grave and solemn rites of Protestant worship, the organ is the only instrument deemed worth accompany the prayers and thanksgivings of the faithful; and the effec its sublime harmonies, in deepening our feelings of religious awe veneration, has been felt by every one. Considered, however, in rela to its general utility, and its importance as constituting a branch national manufacture, the organ holds a place very inferior to the pi forte. Those powers from which it derives its peculiar value are the re of large size; hence it cannot become a domestic instrument, unless in the lofty roofs of the great and wealthy; while its powers are so limite variety, that, even in great houses, the pianoforte is much more avail for almost every musical purpose. The organ, therefore, is confined al exclusively to churches and other places of religious worship; being, m over, very costly, and almost as durable as the edifice in which it is erec the demand for this noblest of instruments is supplied by a comparati small number of manufacturers.

The organ is a very ancient instrument. The principle of its construct notwithstanding the complexity of its modern mechanism, is exceedi simple. It is, in fact, neither more nor less than a gigantic Pan's pipe, sounds being produced by wind blown into rows of tubes of differ lengths. When Polyphemus, wishing to serenade the nymph Gala exclaims—

> Bring me a hundred reeds of proper growth,
> To make a pipe for my capacious mouth—

we may imagine the giant's pipe, with its hundred reeds, and its sou like the roarings of the blast, to have been the most primitive form of organ. It remained to substitute wood or metal for reeds, to blow into pipes by means of bellows, and to open and shut them by keys; and instrument became, in its general features, nearly what it is at present.

This appears to have been done a thousand years ago. There is rea to believe that an organ was sent as a present from the Greek Empe Constantine to King Pepin of France, in the eighth century; and, in tenth, the organ was in general use in Germany, France, and England. those days, of course, it was a rude instrument. An organ erected by Elphegus, Bishop of Winchester, in the Cathedral of that city, requi seventy men to work its bellows. From Beddoes de Celles' curious w on the Organ, we learn that the organ-keys were at first five or six inc broad, and must have consequently been played upon, not by pressur the finger, but by blows of the fist. We learn also, that, in the beginn of the twelfth century, the compass of the instrument did not exceed t octaves, and that it was not till the end of the sixteenth century that machinery for the multiplication of *stops* was invented.

From that time, the cathedrals, churches, and convents of the princi countries in Europe came to be supplied with organs. The organ-build of Germany and Flanders took the lead in the magnitude and power their instruments, and maintained their pre-eminence till they w gradually rivalled and surpassed by our countrymen. The great Haerl organ, which, within our memory, used to be talked of as one of the wond of the world, has lost its solitary supremacy, and is acknowledged to equalled, if not excelled, by the organs of York and Birmingham. T rich ecclesiastical establishments of Italy and Spain are, of course, suppli sufficiently with organs; but it does not appear that the manufacture of t

nent has risen to any great height in those countries. The English unquestionably now take precedence of all other [illegible] to this, that scarcely any foreign organs were sent to the Exhibition. principal organs in the Exhibition were [illegible] was one, by Mr. Willis, of enormous size [illegible] unprecedented ude. It has 77 stops, and 4474 pipes; the largest pipe being of 32 nd giving the lowest note known in music—the C which is two lower than the note given by the fourth string of the violoncello. three rows of keys—the great organ, the choir organ, and the swell; pedals extending to two octaves and a half.

Hill, one of the most eminent of our organ builders, exhibited a great ble church organ, containing 15 stops, with a corresponding number pes, two rows of keys, and pedals. It displays several important ements in mechanism, which have been made by Mr. Hill. One of s a contrivance for the important purpose of lightening the touch of trument, so as to make the pipes instantly "speak" by a moderate re of the finger. We could not easily make the mechanical means omplishing this object intelligible in a notice of this kind; but the s that this great instrument is almost as easily played upon as a pianoforte, and the most rapid passages are rendered clear and ate. There is also an ingenious contrivance to enable the performer ge the stops without the noise and interruption to his playing, that ly attend this operation. In organ-music many of the finest effects duced by constantly changing the stops, and throwing them into l varied combinations; and, therefore, the means of making these easily and promptly is of the utmost value to the organist.

s. Gray and Davison, also organ-builders of much eminence, d a church organ of great magnitude, consisting of 39 stops, with ows of keys, and two octaves and a half of pedals. Its external was grand and beautiful, the case being of carved oak, and the front chly ornamented.

remainder of the English organs were chamber instruments: d, that is to say, for private dwelling-houses, but requiring large and oms. These were manufactured chiefly by Messrs. Walker, Bishop, ldich. There was also what is called an "enharmonic organ," d to illustrate Colonel Thompson's system of "perfect intonation," ucing those minute divisions of the scale which are necessary in o play perfectly in tune in all the different keys. This same t intonation" is a thing which has often engaged the attention of ive men; volumes have been written upon it, bristling with cal formulæ, geometrical diagrams, and arithmetical calculations; onel Thompson has only attempted what has been attempted by efore him. But every practical musician knows that it is a chimera, acticable as the quadrature of the circle, and, supposing it prac- without value.

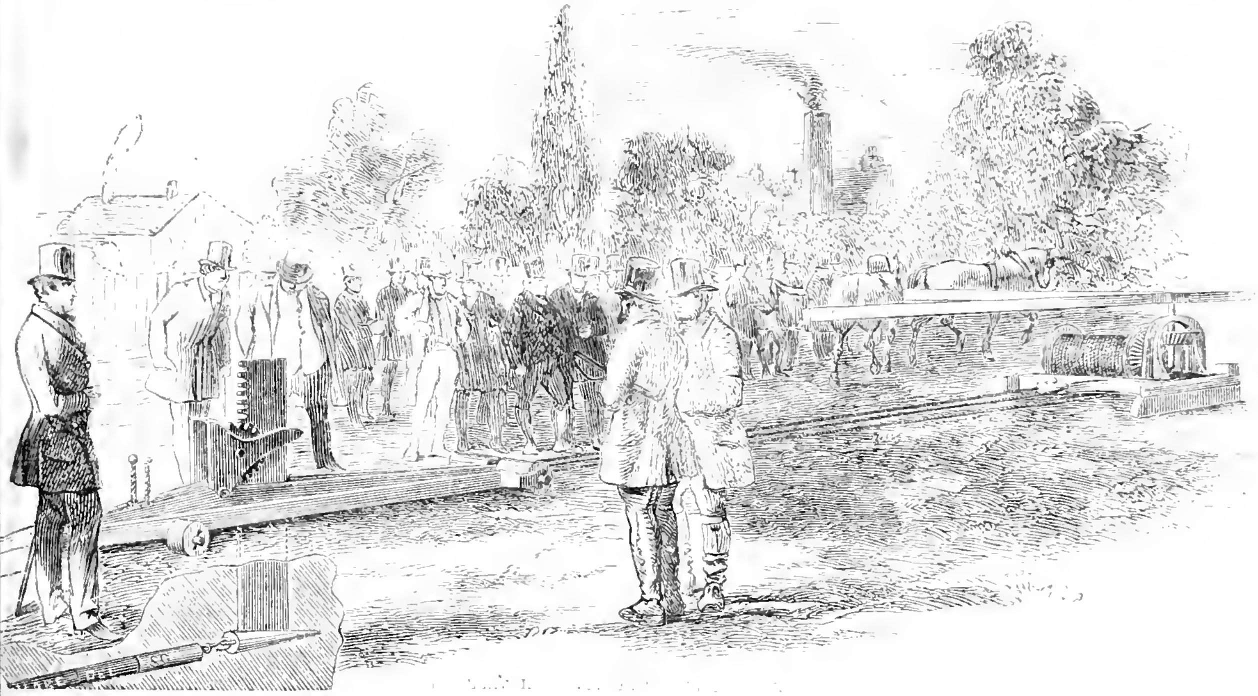
was only one German organ, built by M. Schulze, of Rudolstadt. excellent church organ, of moderate size, with 16 stops, two rows and pedals. France, too, only sent one organ, the work of M. et, of Paris. It has 20 stops, two rows of keys, and two octaves of and must be pronounced a very admirable specimen of French ture.

AGRICULTURAL IMPLEMENTS.

[illegible]

Th[illegible] Fra[illegible] Belgium [illegible] be req[illegible] the [illegible] per cent[illegible]

The [illegible] drain. When commencing work, the [illegible] end of the field, and the capstan is moored at the [illegible] the drum of the capstan and attached to the plough [illegible] draining or soil [illegible] removed round a single [illegible] is required, as shown in the cut. The [illegible] into a hole prepared for them [illegible] to the back of the plug, the hole being [illegible] off [illegible] to enter easily. The horses are attached to the horse[illegible] and by walking in a circular course wind the wire rope on to the drum and pull the plough forward with the pipes attached. When the [illegible] length of drain is completed [illegible] any length up to 22[illegible] the plough is [illegible] rope on which the pipes strung, being unhooked, is pulled out backwards, and the drain is complete.



[illegible]

As it would be inconvenient to have the pipe-rope in one length, it is made in pieces of 50 feet each and by a simple contrivance, as one rope enters, the other is attached to the end. It does not occupy more than one quarter of an hour from the time of finishing one drain to commencing another. The accuracy with which the clay pipes are laid cannot, it is said, be equalled by any hand work; and from the bottom being undisturbed, they are not liable to sink, as is sometimes the case even in the best-executed hand-draining.

By this process, not only is the cost of burying the tiles reduced in many cases 50 per cent., but, from the quickness and neatness of the operation, it can be done at any season of the year, without injury to any short crop or interfering with the common farm operations, the surface soil being untouched, except at the headlands; and where the hedges are low, the capstan can often be fixed in the next field. In undulating or flat lands, the levels are kept, or a fall insured, by working the coulter up and down in the body of the plough, by means of the worm and worm wheel, shown in the cut, the ploughman's eye being guided by a [illegible] balanced on the plough, and a cross staff erected at the end of the field.

Several of these ploughs are now in constant work, and though great lengths of the drains have been opened in the presence of large numbers of agriculturists, in no instance have tiles been found incorrectly laid.

The quantity of draining that can be done per day will vary with each particular field, but in common clay land when the depth does not exceed three feet, between 6,000 and 7,000 feet will be completed with four horses in the common working day; but when the depth exceeds three feet, from two to three horses will not do more than half that quantity. Where it is possible, this draining would be much more cheaply done in summer; as twice the quantity of work may be done by having two teams of horses out, and the other expenses would not be increased in proportion.

FOREIGN AND COLONIAL DEPARTMENTS.

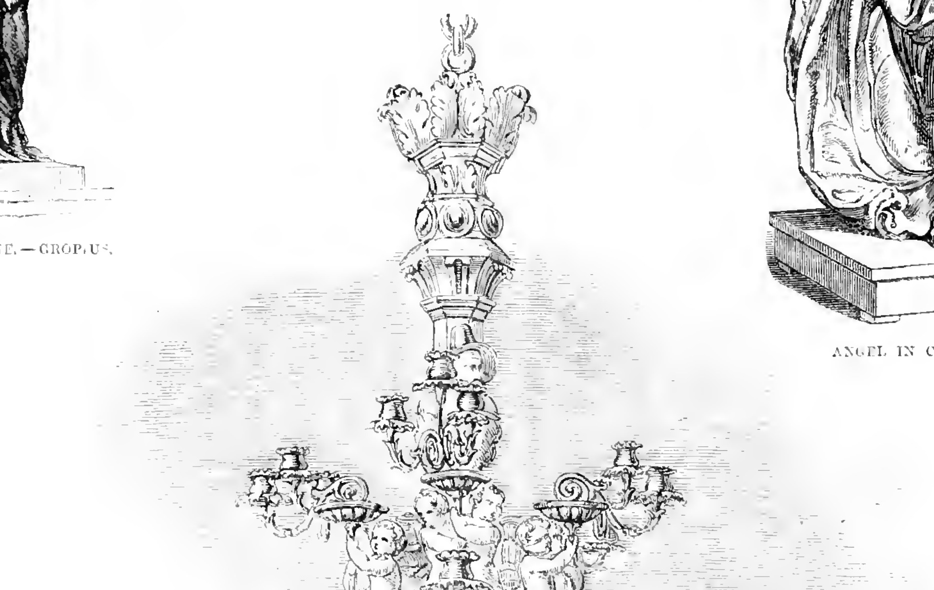
THE ZOLLVEREIN AND GERMAN STATES.

(SECOND NOTICE.)

THE MUSE MELPOMENE.—GROPIUS.

ANGEL IN CENTRE-PIECE.—GR

BEFORE describing the centre hall of the Zollverein, let us direct the attention of our readers to a somewhat elegant pillar which stood on the western side. It represented a group of Amazons—they being apparently great favourites with the Berlin artists, the great Amazon in the nave being only one of many in the Exhibition—made of cast-iron, at the foundry of Berlin, but curiously inlaid with silver. It was remarkable for the simplicity of its form and the beauty of its workmanship. The striking characteristic, indeed, of most of the productions in the centre hall, where were collected the gems of the Verein, was, we think, beauty of form. The principal contents of the hall were statues, statuettes, painted glass ornaments, pictures, one or two cabinets or ladies' desks, porcelain, &c., all belonging to the fine arts, and all in general distinguished by this characteristic. Even the Berlin porcelain, which occupied a large space in the room, and part of which was copied from renowned works of antiquity, such as the Warwick vase, was as beautiful in form as it was for its ornament, though the design on it, after Mieris, Vischer, and others, were as fine as art can produce. Less meretricious in ornament than the productions of Paris, and less encumbered with it than those of London, the artistic productions of Berlin, and, indeed, of all Germany, were chiefly agreeable from the beauty of their forms. Even the elaborate carvings in ivory from Darmstadt, particularly the large goblet, on which the great victory of Hermann or Arminius, from a picture in the possession of the Grand Duke of Baden, was carved in alto relievo, was almost as remarkable for a graceful shape as for admirable carving. By crowding their finest room with almost innumerable articles of *vertù*, puzzling us



ORMOLU CHANDELIER.—BERNSTORFF.

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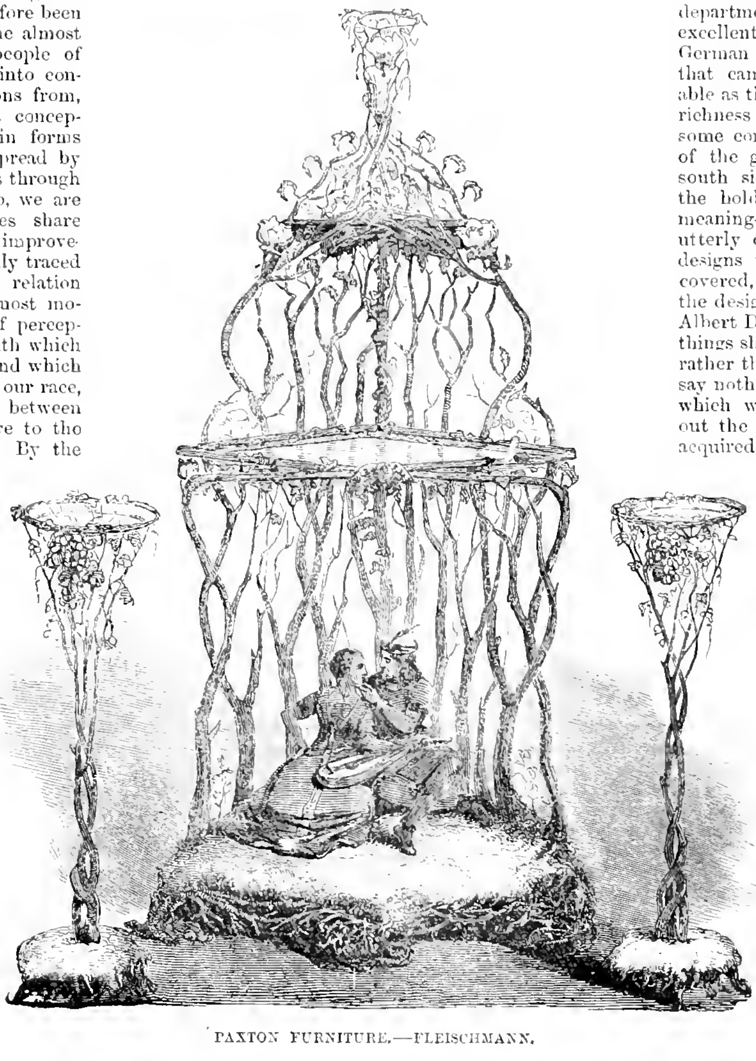
and Scandinavian tribes, judging the rude figures of their old idols earliest heroes yet extant, a percep- of fine forms was not innate. It red cultivation, and has been culti- by studying the examples of the who were endowed with these per- ns. The highborn and well educated, pulent and the ruling classes, have the means of extending that culti- . They are conduits through which d Greek perceptions have been con- to their unendowed and uncultii- countrymen. Thus we find their nce and the influence of courts more cial in these arts than in any others. rn artists cannot boast of much ty of conception. Their finest works, er of sculpture, painting, or archi- e, are generally imitations of the its. Nature is as pure and as free the times of the Greeks; but man's nt perceptions are so mixed with t and derived knowledge, that they onfused; and artists are often the graceful when they return to the al forms. For many years, even for ries, European artists and their pa- have aimed at little more than at ing amongst the rude people of the a knowledge of the forms that g up intuitively in the minds of the s, and that they have only acquired laborious process. By the Exhibi- his species of cultivation is rapidly led; and it seems likely to do in a few weeks or months, to diffuse st our people a knowledge of grace- d artistic forms, than has before been in ages. For the first time almost r history the common people of nd are brought familiarly into con- with, and derive instructions from, lear, definite, and brilliant concep- of the Greeks, embodied in forms have been preserved and spread by fluence of artists and courts through urope. Of our people, too, we are to say that the females share y in the enjoyment and improve- By a curious, and yet easily traced ction, establishing a moral relation en the most ancient and most mo- nations, the keen powers of percep- f the beautiful in nature with which d Greeks were endowed, and which denied to the ancestors of our race, g a great moral difference between are now made to subserve to the vement of the English. By the ition the bulk of our were made familiar with derived from antiquity, f which they could other- never have attained a ption.

confess, however, to been puzzled, amidst the of articles exhibited by llverein, most of which not above mediocrity, in ng some for illustration. g the articles of *vertù*, e particularly belonging er departments of our al—except to say that ronzes were particulaly y of attention, not the o the statuette of Beet- , one of the most re- ble men of the last age must also mention, that, centre hall, a desk and ing-table for ladies, ma- ured by the Messrs. Brothers, of Wurtzburg, aria, one in the rococo he other in the *Rénais-*

CUPID SHARPENING HIS ARROWS.—LEEB, OF MUNICH.



PAXTON FURNITURE.—FLEISCHMANN.

sance style, were remarkable for the good taste they evinced. In this room, too, a large collection of miniatures, painted on ivory, by a new method, by a Wirtemburg artist named Hilder, commanded notice by their boldness, though the artist did not inform the public what his new method consisted in. We will not say more of the centre hall than to add, that the mass of things, many of them trifling, and some of them incongruous, which were there crowded together, was most unfavourable to a due appreciation of the separate arti- cles. The inhabitants of the Zollverein have been ill-served by their Commissioners.

Amongst the articles of utility, the cloths, which were very abundant, took the first place in the Zollverein; and remembering that the manufacture of fine cloth is rather modern in Germany, and that homespun woollens, till very recently, formed the staple dresses of the bulk of the peasantry, the progress of the Germans in making fine cloth does them great credit. For some of that they may thank our restrictive laws, which partly force their industry into that channel, and compel them to grow wool and weave it, instead of growing corn and exchanging it for woollens. The damasks of Saxony and the linens of Silesia, the latter now not so highly honoured as they were wont to be, also occupied a large space in the halls and in the galleries, and they are very old and very favourite productions of Germany. In damask linens they excel; and the productions of Messrs. Proels, senior, and Sons, of Leipsic, in the Saxon department, may be mentioned as an excellent example of the produce of the German looms. Many of the woollens that came from Prussia were as remark- able as the celebrated Berlin wool for the richness of their dyes; and there were some common enough cloths at the end of the gallery of the Zollverein, of the south side, worth notice on account of the boldness and distinctness, and the meaning—for many of our patterns are utterly destitute of any meaning—of the designs which ornament them. We dis- covered, on referring to the catalogue, that the designs were copies of wood-cuts after Albert Durer, and we do not see why such things should not generally be reproduced, rather than unmeaning scrolls. We need say nothing of the patterns and the wool which were profusely displayed through- out the Prussian department, which has acquired a world-wide reputation as Berlin work, the delight of our wives, daughters, and mo- thers, and very often of no little comfort to ourselves in its results, if we are occasion- ally annoyed by it in its pro- gress. Patterns, as well as the materials for embodying them in the canvas, abounded in almost every part of the Zollverein, together with car- pets, rugs, table-covers, &c. In fact, the two circum stances, of the splendid dyes and the excellent designs, for which Prussian workmen and artists are famous, have com- bined to make Berlin work so general a favourite. In damask linens, in fine cloths of various kinds, and in wool- lens of every description and for every use, the Zollverein was particularly rich. Taken as a whole, woollens were not only the most useful but the most conspicuous production of German industry, and those

in which they have attained the greatest excellence and are making the most rapid advances. Connected, too, with them, we must add that there were numerous specimens of very fine wool, the produce of the German provinces and other flocks.

Berlin has been famous, at least since the time of Diesbach, 1710, when Prussian blue was discovered, for its chemical products; and all through the eighteenth century, as well as before it commenced, some of the most distinguished names in the annals of chemistry were those of Germany. After the woollens, the chemical products of the Zollverein in the Exhibition ranked high. The specimens of beet-root sugar, which were perfect and the product entirely of chemical art, the specimens of perfumery, of various salts and pigments, the crystals of several substances exhibited, all testified to the fact that the Germans continue on this point to deserve their well-acquired reputation.

In the vast and very miscellaneous productions which they sent us, we can only particularise a few more. We observed numerous specimens of types and of books, ornamented and plain, which did honour to German typography and their skill in illustration. Contrasting some of the books displayed there by Decker and others with the ordinary books and newspapers of Germany, it is impossible not to wish that in the matter of paper at least some of the substantiality of the books exhibited might be imparted to the common productions of the booksellers. But it is probable, after all that is said of the durability of books, that the most flimsy are the best adapted for our transition age, as not likely long to stand in the way, either on our bookshelves or in our minds, of the improved works of which they are to be the parents. Connected with books, were many maps, geological as well as geographical, with a large globe to show the comparative elevation of the mountains of the earth, and other helps to diffuse knowledge. The Germans are not behind in applying papier mâché, which will take any form, and which, though made from refuse, is one of the products of human skill best adapted, of all those yet acquired, to various figured ornaments, as well as to many useful instruments and utensils. The Germans exhibited many specimens of their success in papier mâché, the name of which informs us that the art is neither of English nor of German invention. As we had specimens of our coal, so the Germans, particularly in the Hamburgh department, exhibited many specimens of their charcoals, of which they make great use, and which they apply in various forms to various purposes. They showed us, also, many of their mineral products, particularly from Nassau, from which little else had been brought than ores of lead, copper, zinc, manganese, iron, &c. Other things in which they excelled, or at least made a good show, were philosophical and musical instruments—characteristic of their harmony and their devotion to science. In the Hamburgh department, we found not only some excellent furniture, but veneers fifty-four plates to the inch: or the mahogany is cut into planks, each of which is only the 54th part of an inch thick. Till a recent period, when Sir Robert Peel abolished the duties on furniture woods, the inhabitants of Hamburgh had a considerable advantage over our furniture makers, and they sent great quantities of furniture to various parts of America. They still carry on this profitable and useful business; but our people are now in a better condition to compete with them than they were, and, by the abolition of the duties, a valuable trade has been preserved to our country.

Here we must stop. Though the productions of German industry were by no means so numerous, so rich, nor so varied as those of French industry, with which, excluding Austria, they might be most appropriately compared—though the Germans were in the Exhibition remarkably deficient in machinery—their products were numerous and miscellaneous, and we can only, by treating of them under some of the various papers in which we technologically examine the different products found in the Exhibition, do them justice in detail. In general, except as to cast iron, bronzes, chemicals, dyes, and some woollens, German industry seemed a step below that of either France or England. It is, however, plain that the Germans have a great aptitude to improvement: we regard them as only recently aroused to a due sense of their relative position in knowledge, skill, politics, and morals, to the rest of Europe. They occupy a noble country; and as they become sensible of their wants, they cannot fail to achieve a commanding success. In them we have great reason to be interested, and them we must wish to see strong, prosperous, and united. They stand between European civilisation and Cossack barbarity: and the hope we have that the latter will not be suffered to advance and prevail westward, rests on the Germans and rests on the improving people as contradistinguished from their interfering and, we are afraid, sometimes retrograde rulers.

ILLUSTRATIONS.

PAXTON FURNITURE.—BY FLEISCHMANN, OF SONNENBERG.

FLEISCHMANN, of Sonnenberg, in the Duchy of Saxe-Meiningen, exhibited a variety of decorative subjects, in a style peculiar to many provincial parts of Germany; a style in which lightness of material is combined with great fancifulness of device, and much gaudiness of colouring, gilding, &c. These things would hardly pass muster in busy, business-like London, with its cold smoky atmosphere, either as works of utility or ornament; but in the villa residences on the Rhenish provinces they serve to fill up a vacant corner, and to gratify the eye of a simple-minded people with representations of natural objects, which, though of every day recurrence, are esteemed as emblems of their nationality. The vine, the chase, the guitar and the lover, make up the sum of a German's earthly enjoyments. Iron and glass are the chief materials of these articles, which, in consequence have been named, in honour of the architect of the Crystal Palace, "Paxton Furniture."

CUPID SHARPENING HIS ARROWS.—BY LEEB.

THIS little marble figure, executed by Leeb, of Munich, stood in Zollverein Court, where, attractive at a distance, it disappointed up careful inspection. The figure is not that of a Cupid, neither are the v neither are the expression and the attitude; the limbs, being all str lines and angles, are inelegant.

STUFFED ANIMALS FROM WIRTEMBERG.

AMID the wide range of foreign industrial products, stuffed and prese animals are to be found only in that portion of the Zollverein consec to Wirtemberg, and these formed a very conspicuous feature in the Ge exhibition: the defile—both sides of which they line—being one of points in which policemen had to be stationed to marshal the crowd way that they should go." The specimens were of two classes—ordin preserved birds and beasts, aiming only at being fac-similes of living na and animals of various species, endowed with a caricatured expressi human intelligence, and represented in illustrations of legends and fabl occupied with human pursuits, and performing human actions. We en two comical specimens of the latter class, in another part of this sheet

STATUETTES. BY GROPIUS.

THE productions in *Papier Mâché*, paper, and stone, by Gropius, of B exhibit great variety, and considerable applicability for building decor The figure of an angel, which we engrave, is bronzed, and is appropria a niche in a church. The other represents the muse Melpomene.

ORMOLU CHANDELIER.—BY BERNSTORFF.

THE chandelier by Bernstorff & Co., of Hanover, is of the old, heavy, st fashion which was in vogue in Germany a century ago, and appears nev have gone out. It contains every possible variety of style, and almost variety of ornamental device. It is of bronze gilt, and will hold 60 li

THE ARTS OF DESIGN AND DECORATION.

MOSAICS FROM ROME.

MOSAICS are a kind of picture, executed with small pieces of gl wood, pebbles, enamel, &c., fixed upon any given surface by mea mastic. Although this branch of art was well known and much pra by the ancients, Pliny has spoken of no express style, nor has he parti ised any of the artists who wrought in it. We can only judge, therefo the appearance of antique relics of this kind, and by comparing them modern performances, the method of executing which is known t When an artist commences a work in mosaic, he cuts in a stone p certain space, which he encircles with bands of iron. This space is co with thick mastic, on which are laid, conformably to the particular d the various substances meant to be used. During the whole of his the artist must have his eye constantly fixed on the picture which it object to copy. The mastic, in time, acquires the consistency of ston is susceptible of a polish like crystal. However, as the brilliancy acquired is injurious to the effect of the design itself, which is not c perceived through it, those mosaics which are applied to the adornme cupolas, ceilings, &c., are generally less elaborately polished, the dis from which they are viewed preventing the spectator from detectin inequalities of surface, or the interstices between the pieces of whic work is composed. The means have been discovered of giving t colour of glass so many different shades, that it has been found to serv purposes of all the various descriptions of painting. The artist in m has all his various materials ranged before him in compartments, acco to their several tints, in much the same way as the printer arrange different letters. To Pompeo Savini, of Urbino, has been attribute art of executing mosaics in relievo.

The origin of mosaic-work must, apparently, be sought in the Eas rich carpets of which were imitated in hard stone. It is probable tha art was known to the Phœnicians, but to the Greeks its perfection glory are to be attributed. From Greece it passed, with the other mental points of knowledge, into Rome, towards the end of the rep the Italian conquerors of Greece transporting from that country into own the most beautiful specimens, in the shape of pavements, &c., v they could discover. Sylla was the first Roman who caused a pie mosaic-work of any magnitude to be executed for the temple of Fortu Præneste (now Palestrina), which mosaic, at least a great portion of it, exists. At first they ornamented in this manner the pavements of buil merely, but after awhile the walls and arched ceilings also. The tents o generals, in time of war, were also paved thus, to keep off the humidi the ground, as Suetonius reports, of the tent of Julius Cæsar. The inve of coloured glass was a great discovery for the purposes of mosaic wor

When the dark ages had driven the elegant arts out of Italy, mo work, as well as painting and sculpture, was preserved a considerable amongst the Byzanthian Greeks, who used it to adorn the altars of churches. Towards the conclusion of the thirteenth century, an Itali the name of Tafi learnt to work in mosaic of a Greek called Apollo who decorated the cathedral of St. Mark at Venice, where is still prese an admirable pavement executed by him. But in general, these work wanting in design, are in bad taste, and equally bad in colouring. then, the art has been brought, in Italy, to a very high degree of pe tion. Pope Clement the Eighth, at the commencement of the sevente century, contributed much to this end by adorning in mosaic all interior part of the dome of St. Peter's. Among the earliest artists ployed thereon were Paul Rossetti and Francis Zucchi.

One of the greatest advantages of mosaic is its power of resistin

things which ordinarily affect the beauty of painting, and another facility with which one can repolish it without at all hazarding the brightness and effect of the colouring. At the same time, as it can only be executed slowly, and requires great exertion, it can never come into such general use as painting; nor would it have attained the degree of perfection which it did at Rome and Florence, had not the respective governments of those two states made a point of encouraging it.

Among the most beautiful mosaics preserved in the pavements or walls of ancient buildings, we may particularise that found in a chamber in Adrian's villa, near Tivoli; the Palestrine mosaic, before alluded to, and which is remarkable for the light which its delineations throw on the history, local and natural, of Egypt. In the villa Albani is also a beautiful one discovered in the territory of Urbino, which represents a school of philosophers, and another depicting the liberation of Hesione, daughter of Priam. In 1763, was found, in a villa near Pompeii (probably that of the Emperor Claudius), a mosaic representing females with comic masks, and playing on various instruments. The name of the artist (Dioscorides, of Samos) was given thereon in Greek letters. There are, besides, a very great number of others, which have been at sundry times dug up, and which exhibit a greater or less degree of beauty and excellence in the art.

Among the most distinguished artists in this line may be enumerated the following: — Gaddo Gaddis, who died in 1312; Angelo Gaddi; Giotto, died 1336; Ghirlandajo, died 1493; Pietra Ola, died 1500; Franc. and Valerio Zuccati, in 1545; Alex. Franc. Scalza, Ferd. ... Giov. Fratini, ... Ricci, Thom. Brando, ... ab. Mercanti, to 1550; Louis Caje... 1559; Ang. Sabba... ernasconi, Ambr. Vitalde Massa, P. Lambert de Cortona, Cruciano de Marcerata, Giov. ..., Fr. Zucchi, P. Rosetti, and Cæsar Torelli, who departed this life at the end of the fifteenth century; Giov. Calandra, died 1644, invented a mastic for fixing the pieces in a manner more solid than had hitherto practised; Giov. Merlini, Giov. Ciachetti, Bottini, Cosm. ...r, Giov. Giorgi, Lor. Bottini, Giov. Bianchi, Carlo Centinelli, and whom Baldinucci cites as the first artists employed in the fabric of the mosaics of the Gallery of Florence, and who died about the end of the seventeenth century. At the same epoch flourished also ...pina, Oraz. Manetta, and Matth. Piccioni; Marcel. Provenzale, who died 1693; La Valette, 1710; Nic. Brocchi, 1713; Phil. Cocchi, Nic. ...io, Bern. Regolo, Funo, Guil. Palat, Franc. Fiano. The city of ..., a few years ago (and perhaps still), possessed a school of painters in ..., directed by M. Belloni.

Amongst the mosaics exhibited in the Crystal Palace was a table by the Chevalier Barberi, on which the Bay of Naples, the Bay of Genoa, the Forum at Rome, St. Peter's and other celebrated views, are represented with a truth of perspective, the rich tone of colour, the accuracy of execution, and the perfect finish to be found only in the most exquisite of oil paintings; so much so that the spectator might almost require to satisfy himself by microscopic examination that the work of art before him was not the production of pencil and pigments, but of things widely different.

There was another mosaic to which we would also direct attention, if it were not invidious to particularise where all were excellent of their kind; but we dwell on it, partly because it is a copy of a *chef d'œuvre* of Italian art—Guercino's "John the Baptist"—and partly because it has been produced in the great parent school of Roman mosaic art, the studio of the Vatican. It is the work of Signor Raffaelle Castellini.

Although the *Studio de Mosaici* in the Vatican, which is maintained at great expense by the Papal Government, solely for the purpose of decorating churches with [illegible] copies of masterpieces of painting, may be regarded as the great parent school which has developed to its present state of perfection the art of mosaic [illegible], there are, nevertheless, private establishments which produce works of great beauty for the decoration of mansions and [illegible]. [illegible] of these the mosaics in the Exhibition are beautiful specimens. Besides the one already referred to, there were two handsome tables by [illegible] Boschetti, and other by Luigi and Domenico Moglia, presenting views of the Roman Forum, the Coliseum, the temple of Pæstum, &c., which stood the test of close inspection, being very admirable works. Although the table above referred to, by the Chevalier Barberi, [illegible] of European celebrity, is a most exquisite [illegible] worthy of [illegible], it is very much to be regretted that he had not been allowed to exhibit to the admiring eyes of all nations in the Crystal Palace a *chef d'œuvre* which he has just completed for the Emperor of Russia, and which he is obliged to transmit immediately to St. Petersburg, viz. a large octagonal pavement, containing twenty-eight figures, the central piece being a colossal head of Medusa, and the whole being surrounded by a border of fruits and flowers. The design is copied on a reduced scale from an ancient pavement in one of the rooms of the Vatican museum; but it would be impossible for any one thing to surpass another to a greater degree than that to which Barberi's copy excels the original in drawing, colouring, and style of execution generally. He was aided in his work by his Russian pupils, who have been placed in his studio by the Czar for the purpose of learning the art of mosaic decoration, with a view to founding a school of mosaic at St. Petersburg.

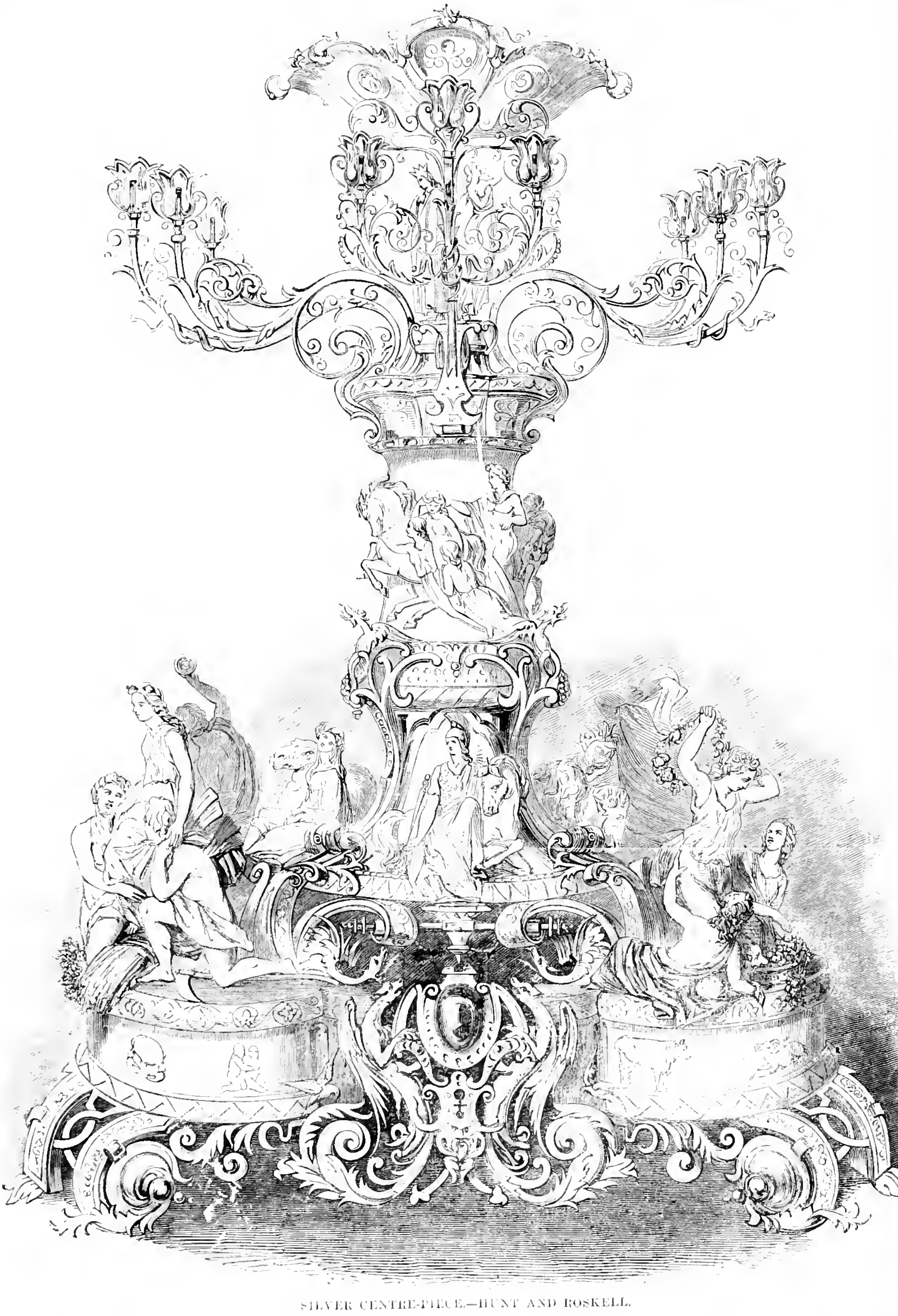
M[illegible] BARBERI.

The improvements in the mechanical parts of the operation of mosaic painting which have been introduced by Barberi are so great, that a work which would require upwards of four years for its completion in the Vatican studio, is executed by him in less than a year and a half. A remarkable instance of this celerity of operation was recently manifested at his studio, where a copy in mosaic of the St. Nicholas in the church of St. Peter, which had been ordered by the Emperor of Russia, was made in something less than two years, although a similar work at the Vatican occupied from four to five years.

The pavement above referred to took three years and a half in its execution. But these are works on the grand scale, to which the mosaics in the Exhibition only bear the relation of miniatures to full-length paintings. The latter, however, were well calculated to impress on a mind hitherto unacquainted with mosaic works, a correct idea of this peculiar and beautiful branch of art.

SILVER CENTRE-PIECE, BY HUNT AND ROSKELL.

THIS magnificent centre ornament and *plateau* by Messrs. Hunt and Roskell, which stood in the West Nave, near the Canadian Department, has been executed with a view to exhibit the capabilities of silver in its application to sculpture and decorative art. It is adapted as a stand for flowers by day, and as a candelabrum by night; and with these objects the various groups are selected to agree in subject. On each quarter of the *plateau* are groups representing the Seasons: Flora, attended by her nymphs, playing with flowers, and a lamb, personifying Spring; zephyrs, bearing on their shoulders a female figure, crowned with wheat, and carrying the sickle, representing Summer. Autumn is typified by the figures of Silenus, Bacchus, and Pomona; Winter, by aged Saturnus, who, seated on a leafless tree, spreads his mantle over shivering nature. On his left is a figure representing storm and tempest, accompanied by wolves. Beneath the groups



SILVER CENTRE-PIECE.—HUNT AND ROSKELL.

are the signs of the Zodiac. On the foot of the centre ornament are figures representing the quarters of the world, each being accompanied by appropriate animals. The alto-relievo around the column represents Day and Night, attended by the Hours; and around the stem which supports the vase are four figures, representing the Elements. The whole is richly decorated with ornament of the Cinque Cento period.

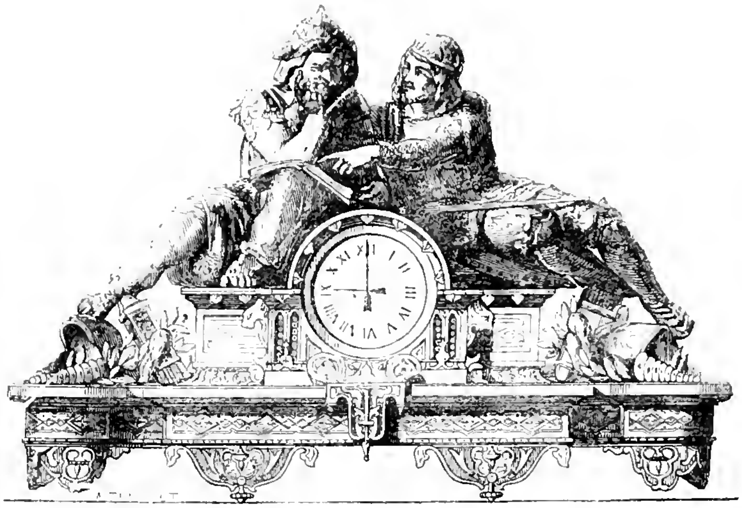
The
CRYSTAL PALACE
AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

THE FRENCH INSTITUTE AND THE GREAT EXHIBITION.

AT an early stage of the Great Exhibition, the Institute of France deputed two of its members, MM. Chevalier and A. Blanqui, to examine and report pon that important European ndertaking. Their report drawn p by M. Blanqui has recently ppeared, and a digest was given f it in the *Illustrated London ews*, for December 13.

In the course of our perusal f this paper, we met frequently ith observations with which we uld not agree, in the extent at ast to which they went, and we lt tempted to discuss many of ese points with the writer in tail. Upon reconsidering the atter, however, we thought it st to let this document speak r itself to the judgment of our aders, many of whom must ve more or less of practical quaintance with the matters which it treats, and the interests which are involved in em.



One or two remarks, however, we must make, but very generally. It will be seen that M. Blanqui is not chary as to the terms with which he ministers to the vanity of his countrymen, and particularly in matters of "taste," in which he unhesitatingly awards them the foremost rank, *longo intervallo* ahead of all the rest of the world. Now, spite of all that has been dinned in our ears upon this point, we might feel disposed to question the fact; and to assert that French taste, in furniture for instance, is for the most part mere copying, and that, not with any settled principle in the choice of models; whilst in high art it is decidedly lower than ours. The only advantage M. Blanqui allows us, and by which he accounts and as it were apologises for our superiority in useful manufactures is our abundant command of raw materials; and therefore he argues for free trade, in order to give his fellow-countrymen similar advantages. But there is

something more which he entirely overlooks, and which is a more essential feature of our industrial position than the mere command of raw staples, and that is the command of capital,—the division of labour,—the mutual co-operation of communities of men in relative situations of *employer* and *employed;* all which are the result of our habitual respect for the rights of property, and our confidence in the stability of institutions. In justice to that small, but sturdy and respectable republic, Switzerland, also, whose two millions of inhabitants set an example of frugality, industry, and political integrity to the rest of continental Europe, we must protest against her being placed below the line of nations "organised for great manufacturing production." Relatively to her size and population, there is perhaps more strictly manufacturing industry developed and employed in Switzerland than in any other country—England alone excepted; whilst the silk products take nearly an equal rank with those of France herself, and her muslins are unsurpassed.

Allowing, however, for some prejudices, and for some shades of opinion, this document is extremely interesting, and will repay perusal. It is remarkable, moreover, as being the first authentic report, coming from any source of national authority, upon the Great Industrial Exhibition of 1851.

REPORT OF M. BLANQUI.

The task has devolved upon us to report to the Instituto the peculiar features of each of the nations summoned to the Great Exhibition, to point

out the industrial features which distinguish them, and to set forth the practical consequences of this great event. Never was a finer opportunity offered to political economists for the study of phenomena of production and the distribution of wealth throughout the world. Having for its avowed object the promotion of the free circulation of raw materials and manufactured products throughout the world, the means employed for this end, in a genuine comparison of the assembled products of the whole human race, were certainly the most efficacious that could be devised.

The arrangement of the Exhibition and the distribution of the products left little to be desired. The most curious of all is decidedly the Building itself, composed, in reality, of three or four principal portions repeated many thousands of times, in which the light penetrates in waves through a glazed enclosure, whence it has obtained the name of the Crystal Palace. The English nation has allotted to itself one-half of the space contained in this magnificent two-decked vessel; the other half has been distributed among all the other nations, in proportion to the probable extent of their contributions, and the different nations are thus fraternally seated one beside another, in such a manner that they can all be visited without fatigue and almost without interruption by the aid of polyglot catalogues of moderate price.

One important matter alone was wanting in the Catalogues, viz. the prices of the objects exhibited, which would have been of great assistance to us in responding to the wishes of the Institute. But in this case, as in many others, the mercantile spirit has prevailed, and it was only after sharp discussions that this last veil of commercial routine and selfishness was maintained. We cannot refrain from noticing that the result of this has been to leave a gap in the instruction that ought to have been derived from the Universal Exhibition. Publicity of price is *often* an incitement to the purchaser, but it is *always* the surest element of information even to those unprovided with special knowledge. Thus, for example the low price of an article is sufficient to prove that it has been manufactured by a different process from the usual one, or from different materials from those commonly employed.

The first fact which has struck us, and of which the evidence has appeared to us to be every day more clearly demonstrated, is, that in the great contest opened in the Crystal Palace, the only two principal champions are France and England. All the other industrial nations, in spite of their special merits, have seemed only to be present as witnesses in this memorable tourney. China, British India, Persia, and Turkey only represent the past; the United States, Russia, Australia, and Van Diemen's Land represent the future. Prussia, Belgium, Austria, Switzerland, Spain, Italy, gravitate more or less in the orbits of France and England, borrowing from these great producing nations the processes of the arts every day developed there with amazing fruitfulness.

Such is the general aspect of the Universal Exhibition, when considering only the distinctive characteristics of the different nationalities; but, on casting more profound glances into the immense panorama, new horizons are opened to the view, productions but little known are discovered, and raw materials destined, it may be, to exercise an influence equal to that of cotton. Thus Australia displays wools of remarkable quality in unlimited quantity, and at so low a price that they can be sold at less than 75 centimes per French pound, delivered in bond, after having made the voyage from the antipodes. The number of the sheep increases upon this virgin soil with a rapidity and an economy which are truly marvellous. It is a real *wool mine*, which England has added to her coal and iron mines.

Another mine of textile materials appears again to be opening for her in the heart of her Indian possessions, and promises to bestow upon her, under the as yet but little known name of *jute*, a species of hemp, which unites the properties of flax and cotton, and which, if we may trust the enthusiasm and the pretensions of some Scottish manufacturers, would be destined to supersede both these substances. At the same time the richest collection of oleaginous seeds comes from the other side of the line, to compete with the analogous seeds of Europe; and we have counted more than a thousand specimens of new cabinet woods, natives of Canada, Australia, and India, which already show a tendency to supplant mahogany and ebony.

The productions of British India are highly interesting to the technological student, as well as to the philosopher and the economist. There is truly an Indian art, which bears a distinctive stamp, as does French art, and, moreover, an originality which is often elegant and of good taste, such as that of their shawls, which have become the models of ours, and that of the numerous tissues exhibited by the East India Company. The weapons, the pottery, even the furniture, do not in any way resemble those of the Chinese, which are fantastical and frequently monstrous, and which it is necessary we should guard ourselves from confounding with the Oriental style. But Indian art is exclusively of the past. The Indians of the present day are but servile imitators of their predecessors.

The Chinese even more so. Their collection, imperfect though it is, bears witness to the wonderful instinct of this race for the most delicate and difficult manual work. But their porcelain, their works in lacquer and ivory, known from time immemorial, are made at the present day exactly as they have been from the most remote ages. We have nothing to envy them, unless it be the abundance of certain raw materials, and especially silk.

Persia and Turkey, Egypt, Greece, the barbarous states, and that mid region which might be called the Little East, have nothing in common with the great East—not even immobility. There is to be found in these countries the same weakness for tinsel, the same richness of material and poorness of workmanship, but the taste and the art are entirely different and even in their greatest flights they bear the impress of the West. We have, however, been happy to discover two remarkable facts in this region so long unfavoured—they are the revival of industry, properly so called, in Turkey; and that of the cultivation of the soil in Egypt. The Turkish collection alone comprises more than 3300 articles belonging to three natural kingdoms, and arranged with much order and method.

All this curious cluster of the representatives of the past, merits only a purely historical interest in the presence of the decisive instruction furnished by the contemplation of the actual state of production in the great manufacturing countries of Europe. It is there in reality that the Exhibition must be studied in an economic point of view, in order properly to appreciate its general effect. The principal struggle between these countries is carried on in certain great branches of industry, which are worked by the aid of immense capital, and which give employment to thousands of hands such as the cotton, woollen, linen, and silk manufactures, the metal factories the construction of machinery, the ceramic art, leather manufactures, &c.; but a careful examination of all the other branches of human labour has shown how much the smaller branches of industry prevailed over the greater, and how necessary it was to take account of these in order to show exactly the productive power of each nation.

Thus the manufacturing greatness of England and France is strikingly manifested in the great mechanical features of the two countries; their private industrial character, if I may so term it, appears only in their smaller manufactures. Cotton, flax, and wool are woven by the same machines and by the same process in both countries. The most skilful judge would find it difficult to distinguish a linen or cotton cloth woven by machinery on the other side of the Channel from a cloth of the same fineness made on this side with French yarn. It is the same with the woollen cloths from Leeds, which are often as beautiful as those of Elbœuf or Louviers.

But, when we quit the domain of the mechanical arts to enter that of taste, the differences and the genius peculiar to each nation immediately begin to be felt. The Universal Exhibition has brought to light this fact to the honour of France, and has furnished us with new arguments in favour of commercial freedom. It has been demonstrated by the most conclusive evidence, by the comparison of the different products, that the total value created by the smaller branches of industry exceeds that created by the large ones; and that the smaller branches of industry require less capital, give employment to a greater number of hands, develope a greater amount of intelligence, and produce more comforts, with fewer social complications, than the processes of the manufacturers organised under the dominion of machinery and division of labour, pushed to its extreme point.

It is in the former branches of production, so faithful and so varied, that France has shown with an unrivalled glory in the general assembly of civilised nations, and has established her supremacy in an incontestible manner. The French exhibition has held pre-eminence by its taste, without any exception in any part of the world, and has revealed an economic fact well worthy of being dwelt upon by the statesmen of our country, that of knowing that design and form, with no other expenditure than that of the imagination, greatly enhance the values of the articles to which they are applied.

This is, in our opinion, the chief fact of the Great Exhibition of the present year. Is it not therefore, evident, that the most simple means of insuring the success of the French workman, whose individual taste and skill thus adds to the value of his production, would be to emancipate him from all the artificial charges which weigh upon his labour, and especially from the duties on the raw material? Is it not reasonable to think that henceforth he will acquire an unassailable superiority over all his rivals? But what is the case under our present system? For one single branch of metallic manufacture, that of iron, for example, which is carried on on a large scale, and is protected by duties of almost cent. per cent., we reckon thousands of trades paralysed in their development, and often in their mere exercise, by the artificial dearness of iron and steel. Whoever has seen the truly splendid collection of all the industrial works of Sheffield, composed of nearly a thousand different articles, from the finest penknife to the most gigantic circular saw, and that innumerable variety of tools as ingenious as they are powerful, thoroughly understands the decisive influence of the cheapness of the raw materials upon industrial works. We have seen Prussia victorious on many points, and even Belgium in the way of becoming so, on account of the low price of the metallic element in these two countries. And we cannot too often repeat it—and a thousand voices will repeat it after us—the great fact of the Exhibition is the demonstration of the immense power created by the low price of metals. It is sufficient to cast a glance at the collection of English machinery, which forms a veritable arsenal, to appreciate the importance of this power.

These machines are equivalent to a supplementary population of many millions of men, in the service they render Great Britain. They are the principal source of the public and private wealth; they constitute a fund from which, under the empire of Free Trade, our manufacturers might draw the same elements of prosperity as England itself. It was owing to the low price of cast iron, that the very palace in which all these works were assembled was enabled to be reared; and it would suffice to calculate

hat this palace would have cost in France, in order to appreciate the loss which we experience from the rigour of our economic system in this respect.

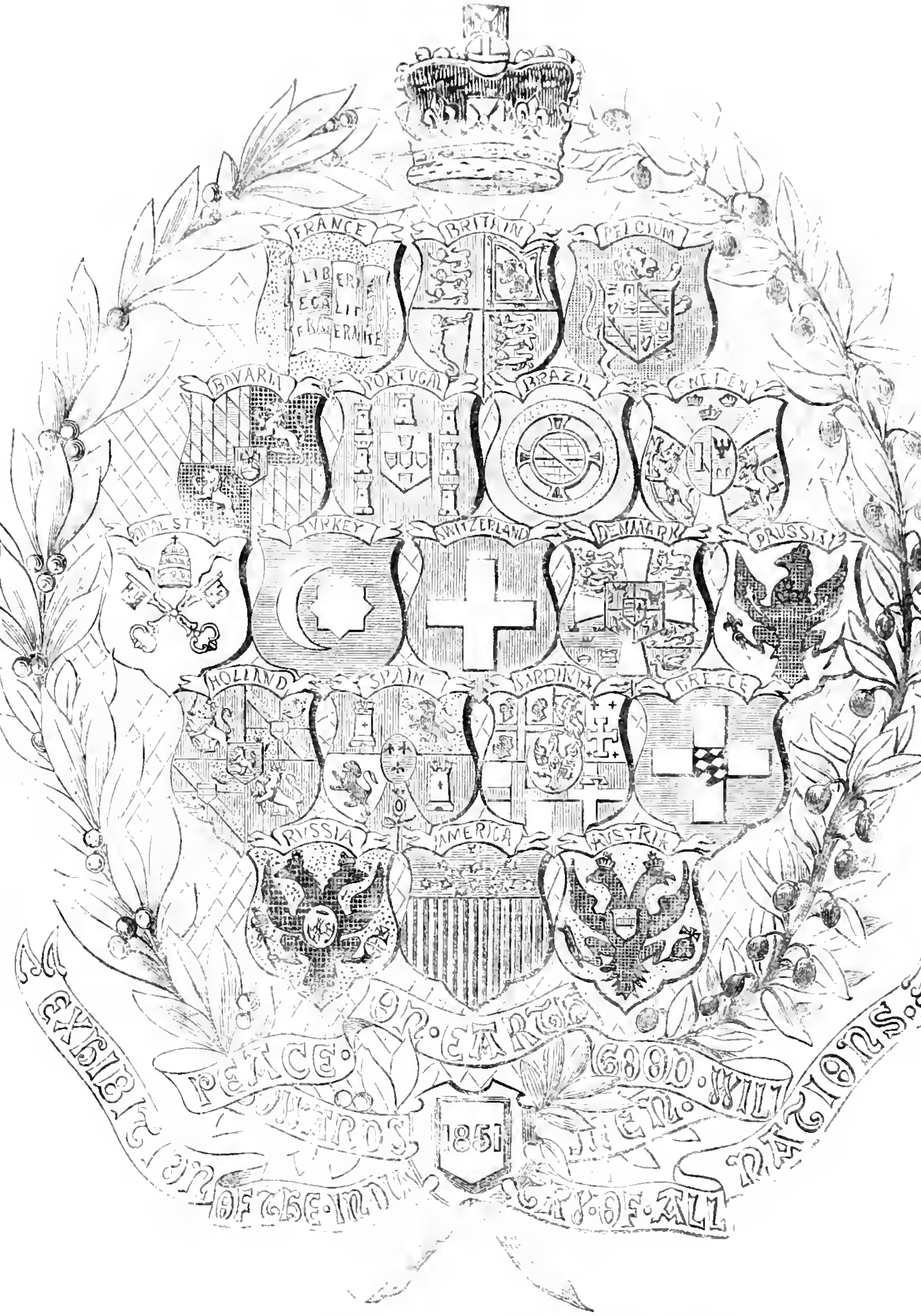
This inferiority is revealed still more evidently in all that concern the gricultural interests in the two countries. No one could believe, without aving seen it, how much power agriculture derives from manufacture by neans of iron. It is employed in nearly every agricultural work, and exeriments are now being made for its still further extension. In all the ther branches f English inustry the oberver is equal- struck with ho superiority f mechanical ork, with the licitous emoyment of on, and with o perfection f the tools. ut this supeority disapears as soon artistic apications and egant forms e brought to question. ero France sumes the vantage, and o laws of r future are vealed to ery eye. ne Englishin excels by e quality d the cheapss of the aterial; the enchman by e ingenious ste of the ork.

Everywhere e the same riking consts found. ok at Ausa, so rewned for Bohemian ss: these sses excel means of e material, the colour, their cheapss; but they end by their l taste. Our at glassrks of Bacat, or Saint uis, which, wever, have appeared the Exhiion, could have been erwise than ners by apring there. eir products evidently erior in n, in the nbination of naments, and in all that depends upon design and variety. In the amic arts, Saxony, so celebrated, has nothing to compare with the celains of Sevrey; and we have seen pieces from Sarreguemines more utiful than such and such a masterpiece of English pottery, the ncipal merit of which consists in lowness of price. Art, in fact, is not ll the matter of articles of consumption. It is necessary that these cles should be within the reach of the greatest number, and that r cost of production should always be reduced to the lowest possible price, especially when this cost depends upon artificial charges unequally apportioned in the universal factor.

In this respect Great Britain offers to all other nations good examples to follow, in point of industrial economy and commercial policy. Her manufactories of machinery are known. Her towns, furnished with formidable looms, have acquired proportions which astonish the imagination. Her cloth, rich with the mingled wools from all parts of the globe, braves the competition of France, of Belgium, and of Prussia. Her glass, of beautiful lustre, is at the present day cut with remarkable perfection; witness that beautiful fountain, ten metres in height, which has unceasingly shed around it a refreshing coolness at the point of intersection of the two avenues.

The chemical products which England, but a short time back, obtained from France, Germany, and Holland, are now produced upon her own soil with unexpected economy of price and richness of quality. The working in leather, skins, and furs is there carried on in proportions every day more considerable. The indigenous earthenware, so well known by its lowness of price, and its commonplace vulgar forms, has extended itself, by means of its cheapness, into every part of the world.

Lastly, the impulse given to all other branches of manufacture has extended even to cabinet making, to paper-hangings, and to fancy articles. Everything is in a state of progress in this land of work and of intelligence, fructified by constantly reviving capital.



SHIELD OF THE ARMS OF ALL NATIONS, IN ENAMEL.—BUSS.—(SEE P. 223.)

The distinctive characteristics of the Exhibition of English products are strength, solidity, and extent. All the elements of wealth are there displayed in a methodical order, from coal to the most complicated machinery. The English have withheld nothing. It might be said, that, far from wishing to rob the nations invited to this great federation of labour of their secrets, they have been anxious to communicate all their own.

(To be continued.)

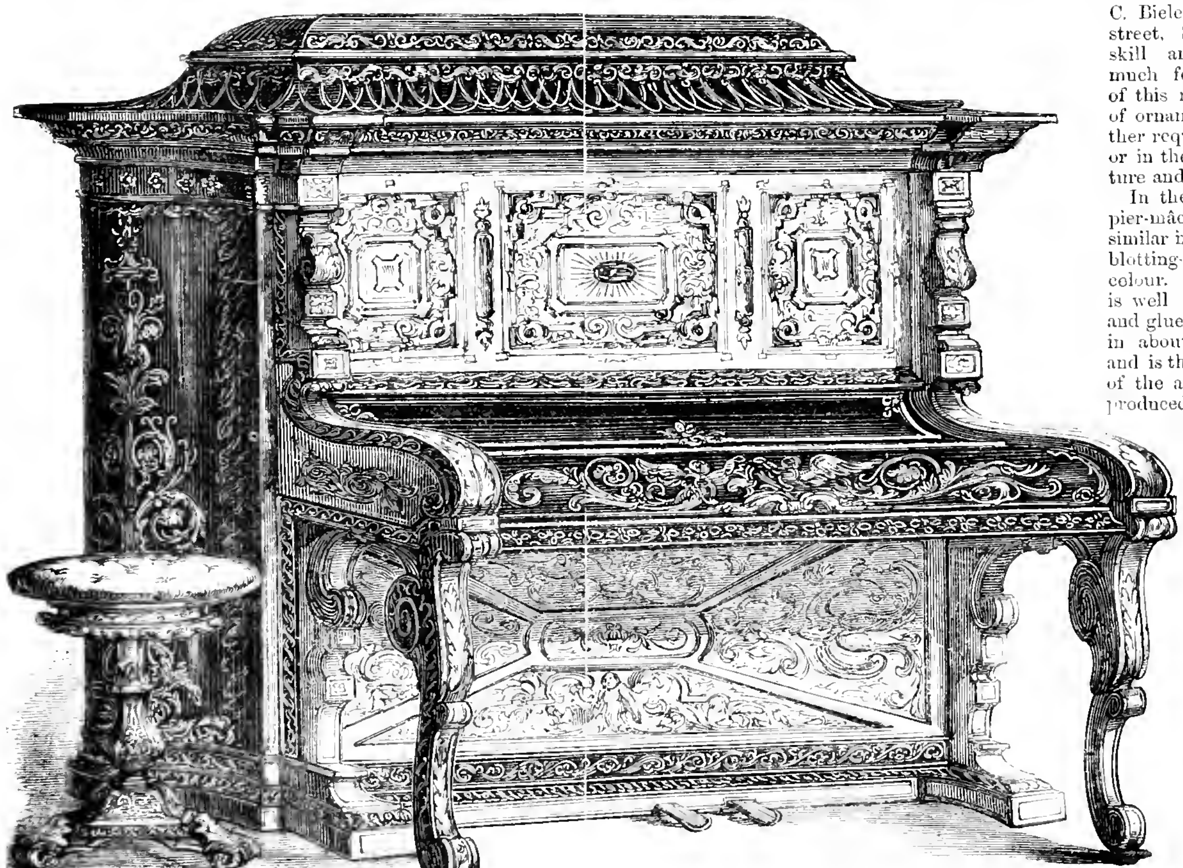
FURNITURE AND DECORATION.

PAPIER-MACHÉ.

AMONG the numerous articles displayed at the Exhibition, there are few which, in their manufactured or finished state, are more attractive to the sight, or which have higher claims to the admiration of the visitor, than those formed of the material known as papier-mâché. Whether in the shape of domestic furniture, to which it has recently been applied, or in articles of general domestic utility, its beauty and agreeableness are equally striking. Indeed, such is the nature of the material—so ductile, so light, and so economical—that it appears adapted for almost universal application. Admitting a polish almost equal to that of glass itself, and receiving colours nearly as bright as those capable of being placed upon canvas, it furnishes a most attractive surface alike to the industrial skill of the humble artisan and to the genius of the artist.

The merit of inventing this beautiful and useful material is claimed by our French neighbours, and the manufacture of the article is carried on to a great extent in Paris; but in the application of this substance to articles of general domestic utility and ornament, it cannot be disputed that we are far ahead at present, not only of France, but of the entire Continent. Indeed, to such an extent is it carried out, that it may almost be considered an industrial art peculiarly our own: and for papier-mâché work Birmingham stands unrivalled. There is an active competition between the English and French work in France itself: indeed, so keenly is the competition felt by our neighbours, that they impose an exceedingly heavy duty upon its importation, amounting almost to a prohibition upon the low-priced articles.

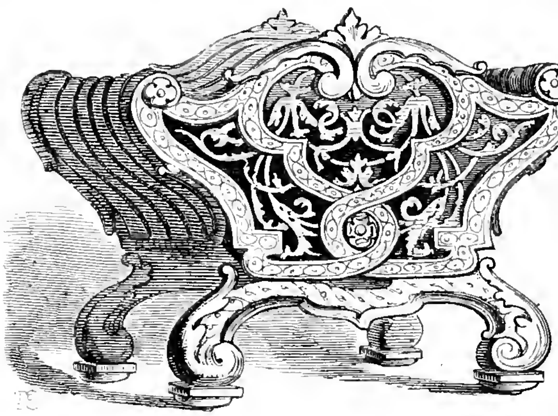
The manufacture of papier-mâché articles was, we believe, first introduced into Birmingham by Messrs. Jennens and Bettridge, of Halkin-street, Knightsbridge—their principal manufactory being at Birmingham—about half a century since. At this stage of the manufacture tea-trays only were made. The inventor and patentee of the manufacture of tea-trays in



[illegible] PAPIER MACHÉ CASE.—JENNENS AND BETTRIDGE.

papier-mâché was Mr. Clay, of Birmingham. The firm has, from the commencement, gradually proceeded to develope the capabilities of this material by adapting it to new purposes, until the variety of articles now produced is almost innumerable. Articles of furniture made from it, such as chairs, tables, sofas, cabinets, secretaires, screens, vases, and even pianofortes, were displayed at the Exhibition, with writing-desks, work-boxes, papeteries, inkstands, &c., in almost endless variety of style and decoration.

In addition to these purposes, the material has been applied for scrolls, foliages, cornices, mouldings, and other articles of internal decoration. Saloons and halls are decorated with panels of papier-mâché, in a style

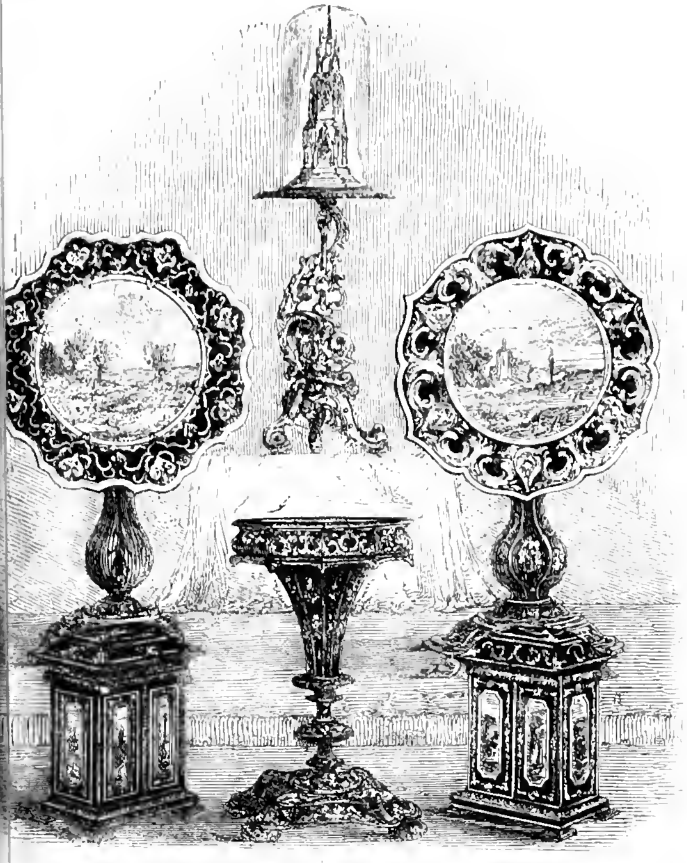


PAPIER MACHÉ CANTERBURY.—JENNENS AND BETTRIDGE.

which has all the beautiful effects of enamelling; and under ordinar circumstances has been found to be remarkably durable. Admirabl specimens of panel-work, formed of this substance, are also to be seen i the saloons of the Europa, Asia, Africa, Hindostan, and Oriental stean packets, but we question whether the material is adapted to bear th constant wear and tear caused by the jarring and shaking of steam-powe and weather combined. M C. Bielefield, of Wellingto street, Strand, has, by h skill and enterprise, dor much for the extended us of this material for all kind of ornamental purposes, wh ther required for flat surface or in the most elaborate pi ture and glass frames.

In the manufacture of p pier-mâché, the paper used similar in texture to ordina blotting-paper, but of a gr colour. Prior to using it, is well saturated with flo and glue, mixed with wate in about equal proportior and is then laid on the mou of the article intended to l produced. These moulds a of iron, brass, copper. The moul coated with the fir layer of paper, then dried at a he of 90 deg. or 1 deg. Fahr. for hours. A caref smoothing by a fi follows, after whi another deposit paper is made. Th processes of dryi and of smoothi are successively r peated with ea additional layer paper, until th article assumes th required streng and thickness, son commodities havir been made of s inches in thickne An ordinary te tray, of a quarter an inch in thicknes takes about thirty sheets of paper, or ten layers. When the newl formed article is taken from the mould, the several parts are plane filed, and trimmed, so as to be correct and level. A process "stoving" next follows, in which the varnish is laid on, and brougl to a smooth, hard, and brilliant surface. This completed, the mo delicate portion of the manufacture commences. The article is coate with several layers of shellac varnish, coloured, which, after bein

hardened by a heat of 280 deg., are scraped level with implements of various degrees of smoothness. The different varnishings, with the subsequent operations, are carried on for a period varying from twelve to



ARTICLES IN PAPIER MACHÉ.—SPIERS AND SON, OXFORD.

ighteen days, according to the purpose for which the article is required. 'he exquisite surface which characterises the finished goods is a distinuishing feature of this material. It is produced by manual polishing with otten stone and oil; but the finish of the articles—the eculiar brilliancy which lends such a freshness to the ainting—is produced independently of roten stone or other powder, by the process of handing" alone.

Among the largest exhibitors of this article ere Messrs. Jennens and Bettridge, Messrs. ackson and Son, of Rathbone-place, Messrs. I'Callam and Hodgson, Mr. Lane, and Messrs. piers and Son, of Oxford. Among the spemens shown by Messrs. Jennens and Betidge, is perhaps the most extraordinary rticle yet produced in this material—a case or a piano forte with music-stool and canterury, designed in the Italian style, and treated ith great simplicity of decoration; the only rnament employed being variously-tinted earl, the effect of which on the jet black of e case is very rich, and, at the same time, xceedingly chaste.

The "Victoria Regia" cot, designed by Mr. Bell, sculptor, and highly wrought in gold and olours with emblematical devices, attracted onsiderable notice, but was not to our taste: -the colours being gaudy and cold, and the hape by no means graceful. There were also—

A "multum in uno" loo table on a new rinciple, combining bagatelle board, chess, raughts, &c., ornamented with inlaid pearl nd gold.

A lotus work-table, designed by Mr. Bell, tted on a new principle, and decorated in a yle appropriate to the form.

A lady's work-table of a shape suggested by the celebrated vase of envenuto Cellini, richly inlaid with pearl and gilt.

"The day dreamer" chair, designed by Mr. H. Fitz Cook, and ornamented ith figures, flowers, &c., allegorically arranged, had a curious and novel appearance; but saying that, we have said all. The figures, allegorical of sleep, dreams, good and bad, were too fanciful and too large, and the colour generally was cold and uncomfortable.

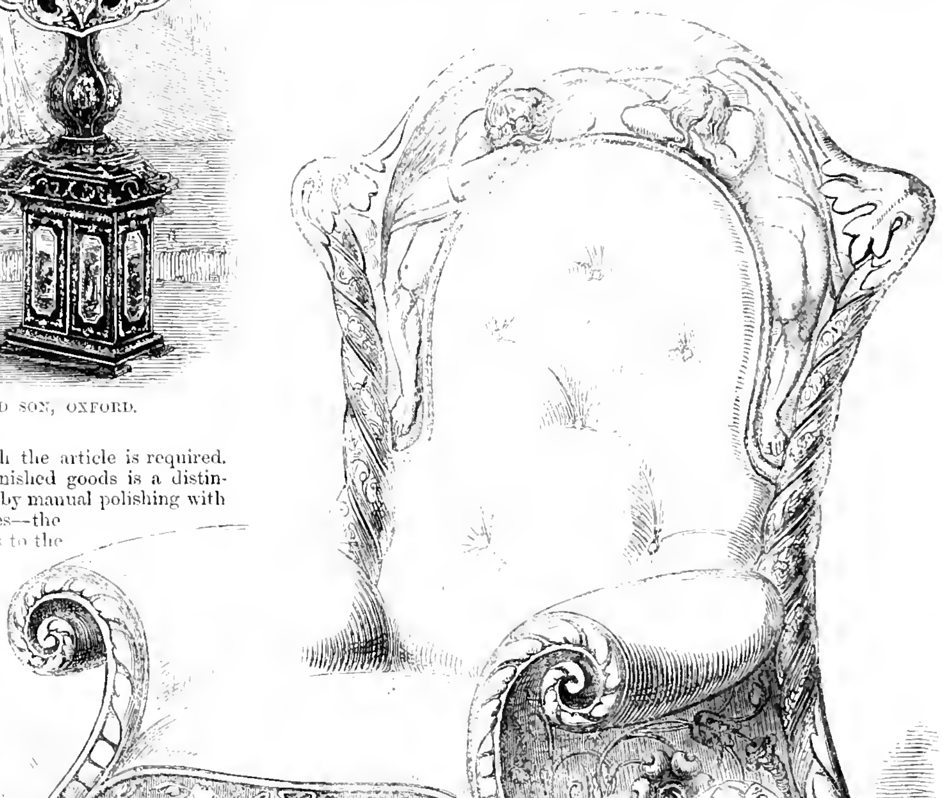
A "légère" chair, inlaid with pearl, was remarkable for its light elegance combined with strength.

A "Prie-Dieu" chair.

A chair, styled Elizabethan, was more properly after the form of the period of William III.

Several trays, including the "Pacha's" tray, ornamented in gold and colours, 58 inches in diameter.

The contributions of Messrs. Spiers and Son, of Oxford, consisted of tables, cabinets, desks, work boxes, albums, portfolios, writers, tea caddies, &c., ornamented with views of the colleges, public buildings, college gardens, and other objects of interest in the University and its neighbourhood. We noticed in them endeavours after a truer and less meretricious style of ornamentation than usually prevails. As the taste of the Oxford people seems to run in a contrary direction to that of the usual purchasers of this description of goods, this firm have taken up the ornamentation of papier mâché in a new style. Instead of adopting the usual subjects of birds, flowers, Chinese landscapes, arabesques, or other less pleasing styles, they conceived that picturesque representations of architectural and landscape subjects, treated in an artist like manner, to which other ornament should be subservient, would be equally interesting to many persons, equally popular, and more conducive to the diffusion of a sound taste. Messrs. Spiers immortalise their native and most learned city in every possible point of view, and upon every possible variety of article. We have Oxford



THE DREAMER'S CHAIR IN PAPIER MACHÉ.—JENNENS AND BETTRIDGE.

from the fields, and Oxford from the river, Oxford in the streets, Oxford colleges, Oxford halls, Oxford staircases, and Oxford seals. These paintings, which are scattered over desks, tables, secretaires, and work-boxes, all are beautifully executed.

POTTERY, PORCELAIN, TILES, &c.

BRITISH MANUFACTURES.

THE first English porcelain was manufactured at Bow and Chelsea, near London, the paste being composed of a mixture of the sand from Alum Bay, in the Isle of Wight, with a plastic clay and powdered flint glass; this was covered with a leaden glaze. This manufactory had considerable success.

In 1748 the manufacture was transferred to Derby, and in 1751 Dr. Wale established at Worcester a manufactory of tender porcelain, called the "Worcester Porcelain Company," which still exists though in other hands. To Dr. Wale is attributed the invention of printing on porcelain, by the transferring of printed patterns from paper to the biscuit. The proposed design is first engraved on copper, and the colouring matter

being applied to the engraving in the same manner as in common copper-plate printing, the design is transferred to paper. This paper is afterwards applied to the biscuit to which the colouring matter forming the design adheres. The paper is then dissolved and washed off, the colouring matter forming the design remaining upon the biscuit. The biscuit is then glazed over the design with a glass glaze, so that after vitrification the design appears under the glass.

The original Worcester Porcelain Company principally limited their business to the manufacture of blue and white porcelain, in imitation of that of Nankin, and making the Japanese pottery. Cookworthy, of Plymouth, continued to carry on the porcelain business at Worcester until 1783, when the manufactory fell into the hands of Mr. Thomas Flight.

About 1751 Messrs. Littler, Yates, and Baddeley attempted the same manufacture in Staffordshire, but without success, and it was not until 1765 that Messrs. Baddeley and Fletcher succeeded in the manufacture of porcelain at Shelton.

In 1768 kaolin and Cornish stone were discovered by Cookworthy, and the introduction of this into the manufacture of porcelain gave the manufacture a considerable impulse, the article acquiring that hardness and translucency so eminently characteristic of the German and Oriental porcelain.

In 1772 the manufacture of fine porcelain was completely established in Staffordshire, 21 years after its establishment at Worcester, and the manufactory continued to be directed by Mr. Richard Champion, the successor of Brown and Cookworthy, until 1782.

In 1800 Spode fabricated a porcelain very superior to all that had preceded it in England, and endeavoured to imitate, not without considerable success, the ancient tender porcelain of Sèvres. He also introduced, or at least improved, the incorporation of calcined bones in the paste, an improvement which has since been carried much further. The establishment of Spode is now represented by Alderman Copeland, and constitutes one of the most extensive of the British porcelain works.

If the British manufacturer have not yet attained that high excellence in the ornamental department of the manufacture of porcelain, and cannot produce paintings after the great masters, enamelled on large slabs of porcelain, to rival those of Sèvres and Meissen, he has proved by the present Exhibition that the day is not far distant when even those productions may be executed in Staffordshire, and that, meanwhile, he has outstripped altogether all rivals in the production of articles fitted for the common use, not only of the middle, but of the most affluent classes, at a price which puts all foreign competition at complete defiance.

In recording these advances in the manufacture of ornamental porcelain for common use, justice requires that the name of Josiah Wedgewood should be set prominently and honourably forward. That enlightened and public-spirited man found the Staffordshire Potteries fabricating only inferior wares, flimsy in their materials, and utterly deficient in taste and elegance in their forms. He surrounded himself with artists of talent, both British and foreign, and called to his aid all the improvements of science which had relation to the manufacture. The effect of his exertions has been, that the wares of that district are now not only brought into general use in England, to the exclusion of all foreign manufactures of the same kind, but English earthenware is sought for and celebrated all over the world, and nowhere more than in those places where foreign porcelain has been previously manufactured.

The following testimony of eminent foreigners, fully competent to judge of this matter, will corroborate this. M. Faujas de St. Fond (quoted in the article on porcelain in *Dr. Lardner's Cyclopædia*) says:—"The excellent workmanship of English porcelain, its solidity, the advantage which it possesses of sustaining the action of fire, its fine glaze, impenetrable to acids, the beauty and convenience of its form, and the cheapness of its price, have given rise to a commerce so active and universal, that in travelling from Paris to St. Petersburg, from Amsterdam to the furthest part of Sweden, or from Dunkirk to the extremity of the south of France, one is served at every inn upon English ware. Spain, Portugal, and Italy are supplied with it, and vessels are loaded with it for both the Indies and the continent of America."

MM. St. Cricq and Lebœuf, in an official report, published in Paris in 1835, affirm that for the fabrication of useful ware the English have enormous advantage over the French—an advantage which in the cost of labour amounts to 100 per cent.

M. St. Amans, an extensive French manufacturer, says that the English surpass all other nations in the fabrication of stoneware remarkable for its lightness, strength, and elegance, and also in printing blue figures upon it of every tint, equal to that of the Chinese, by processes of singular facility and promptitude.

Porcelain in general may be characterised as distinguished from the coarser earthenware as a pottery whose paste is fine-grained, compact, very hard, and faintly translucid. When submitted to the action of heat it undergoes a partial vitrifaction, from which it derives its translucency. It is not correct to say that whiteness constitutes a definite character of porcelain, inasmuch as there are fine porcelain pastes variously coloured.

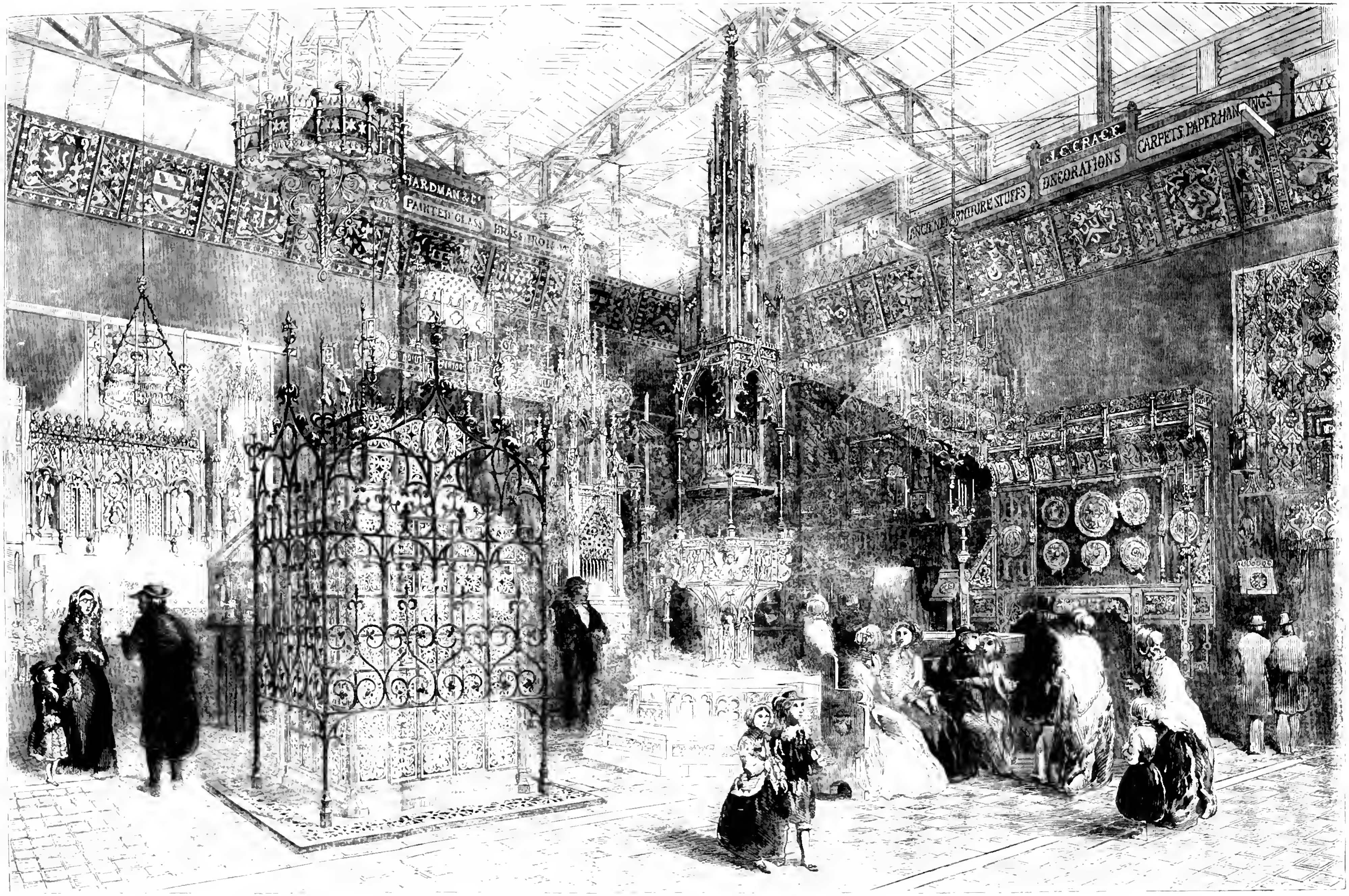
It is very important to attend to and comprehend the distinction between the sorts of porcelain called hard and tender. Hard porcelain which is, as already explained, the species universally fabricated in Germany and the East, is composed of the clay called kaolin, consisting of silica and alumina, which is combined with a flux consisting of silica and lime with a feldspar, which in China is called "petungse." The glaze on this porcelain is earthy, and admits of no metallic or alkaline ingredient.

Tender porcelain, on the other hand, consists of a vitreous frit, which is rendered opaque and less fusible by being mixed with a calcareous or marly clay. Its glaze is an artificial glass, composed of lead, silica, and soda, potash, or other alkali. This porcelain is more vitreous and transparent, and more fusible, than the hard porcelain. It may, indeed, be fused if exposed merely to the temperature which is necessary to bake the hard porcelain. Its glaze also is more glossy and transparent, but less hard, than that of the hard porcelain, since it can be scratched with a steel point.

The English porcelain, with a few exceptions, belongs to the class of tender porcelain, and is not therefore composed merely of kaolin and petungse. It is baked at a much lower temperature than the German or Oriental porcelain. Being manufactured on a very extensive scale, and with great economy and certainty, and comparatively small expenditure of fuel, it is sold at a moderate price compared with the fine porcelain; and how little inferior it is in external appearance might have been seen by comparing the selections exhibited in the gallery of the northern transept with those which were found in the foreign departments.

The English porcelain may be considered as holding a place intermediate between the hard porcelain of China and Germany and fine stoneware. It is distinguished from the first by the paste being more friable, and by its plumbiferous glaze, and from the second by its transparency and its stronger glaze.

Some English porcelain is called ironstone china, and is usually composed of 60 parts of Cornish stone, 40 of kaolin, and 2 of flint glass; or of 42 of feldspar, the same of kaolin, 10 parts of ground flints, and 8 of flint glass. The glaze for the first composition is made with 20 parts of feldspar, 15 of flints, 6 of red lead, and 5 of soda, which are fritted together, and 22 parts of flint glass and 15 of white lead are added. The glaze of the second composition is made of 8 parts of flint glass, 36 of feldspar, 40 of white lead, and 20 of ground flints. These constituents and their proportions are, however, subject to great variation, each manufactory having receipts and proportions peculiar to it.



THE MEDIÆVAL COURT

richly crocketed canopy surmounts the recess, flanked by two buttresses and pinnacles; the back of the recess is diapered, and the centre, within a quatrefoil, is a bas-relief, representing the Doctor, attired as a Bishop, kneeling, and offering the church of which he was the founder.

The base of the tomb contains five quatrefoils, floriated and studded with wallflowers, with enamelled shields of family and ecclesiastical bearings; and along the upper edge is the following inscription, engraved in brass:—

Orate pro anima illustrissimi Reverendissimi Dom. Thomæ Walsh, Ep. Cambysop., in dist. centralis per annos 25 Vic. Ap., et hujus ecclesiæ Cathedralis fundatoris. Obiit. Vic. ap. Londinen. xviii. Feb. MDCCCXLIX.

High Altar.—The centre of the east side is occupied by a stone altar, intended for the chancel of a parish church; the front is supported by four marble pillars, with sculptured caps. These stand some distance in advance of the block part of the altar, which contains three deeply-mounted quatrefoils, surrounded by wallflowers, with three subjects in bas-relief—the "Agony in the Garden," "Our Lord bearing the Cross," and the "Crucifixion;" these groups are sculptured with great severity and truth, and possess a most devotional character. The space between the marble pillars and these sculptures will eventually contain reliquaries like small shrines.

Chimney Piece.—On the west side of the court is a richly carved fire-place, worked in Caen stone; it is intended for the mansion of F. Barchard, Esq. The whole of the ornaments are heraldic, and the crockets are formed by birds encircled with foliage. The centre panel contains the Barchard arms, and the initials of the family fill the lateral quatrefoils. The recess for the grate is lined with tiles, charged with the crest and initials F. B. alternately. The grate is solidly formed of wrought iron, standing on two dogs of the same material, surmounted by brass birds, and enriched with metal badges of beaten work; a stone fender encloses the hearth, which is composed of red and yellow tiles.

The whole of the stone-work in this court was executed by Mr. Myers, of Belvidere-road, Lambeth, London, inventor of the machine for cutting Gothic tracery and mouldings: specimens of the work executed by it are deposited in the court, close to the bishop's tomb.

There is a smaller fire-place at the north-east angle, also executed in Caen stone: it is square headed; the hollows of the mouldings are filled with running foliage; the upper part is divided by beads into three panels, filled with Minton's tiles, chastely and elaborately painted with floral and geometrical patterns. The sides of the fire-place are lined by high tiles of a rich and original pattern, and the hearth is encircled by a stone fender; the whole fire-place has a rich and pleasing effect, produced by the combination of carved stone and the enamel painting of the tile work. There is a small but appropriate grate, supported on dogs, in the fire-place.

The Font.—In the centre of the court is a font and cover raised on octagonal steps, the risers of which are enriched with tracery. The bowl is also octagonal, four sides being carved with the following subjects from sacred history:—"The Fall of Man," "St. John Preaching in the Wilderness," "The Baptism of Our Lord," and the "Crucifixion." From the four other sides are projecting images of angels, which act as corbels to support the four principal shafts of the canopy. Round the pedestal are images of the Evangelists, the "Blessed Virgin," "St. John the Baptist," "St. Peter," and "St. Paul."

The canopy, which is entirely of oak, and supported by the angle-shafts, is raised up to a considerable height by a succession of pinnacles and tabernacle work, and is sufficiently lofty to receive the cover of the font, consisting of an octagonal top, surmounted by open tracy panels, the whole of which rises up into the canopy by the action of counterweight when the font is used; and when lifted to its proper elevation, forms a ceiling, with the Holy Dove in the centre. This principle of uncovering the font is a considerable improvement on the old method of opening a compartment of the high cover; and is at once more elegant and convenient.

Painted Glass.—The north side of the court is filled with painted glass. Over the entrance door is a portion of the south window of the new dining hall at Alton Towers. The centre light contains an effigy of the Grand Talbot, faithfully delineated from his tomb at Whitchurch. On either side are shields with his various quarterings, supported by Talbots, and intersected with foliage and branch-work on a quarry ground, surrounded by a neat border of T's and coronals.

There are two long lights of the Decorated period, with compound niches and pinnacles, each containing an image: one of St. Thomas the Apostle, the other St. Thomas the Martyr, in rich costume, on diapered grounds. These are intended for the court windows of the chantry chapel of the late Dr. Griffiths, in the Collegiate Church of St. Edmunds, near Ware. Over the lower doorway are placed three lights, representing two groups, from the life of St. Andrew, and an effigy of the saint, all under very elaborate canopies. This glass is designed in the style of the fifteenth century, as it is to be fixed in a parochial church of that period. Adjoining the centre pillar are two lights, forming the centre light for the great court window of the same church; the subjects represented are the Transfiguration and Crucifixion of our Lord. At the east end are four lights of grisaille work, each containing two quatrefoils, filled with subjects from the life of the Blessed Virgin. The groups are relieved on a blue glass diapered, and the grisaille is intersected with red and yellow bands, &c., upon floriated centres of varied colours, and each light is surrounded by a varied border. These windows are to be placed on the south side of the Lady Chapel of St. Augustine's Church, at Ramsgate. At the opposite end is another window of two lights, containing niches and canopies, with images of St. Ethelbert of Kent and his Queen the blessed Bertha. The richness of the habits of the two principal figures is well relieved by a white ground; and this style of glass, treated on the old principles, has all the advantages of producing a rich effect, without impeding the sufficiency of light from entering the edifice. This window is also for St. Augustine's, Ramsgate, and is presented to that church by J. Herbert, Esq., the celebrated painter and Academician.

There is a very translucent image of the Virgin, in a blue mantle, of a rich, but subdued colour, precisely similar to that so frequently seen in the old windows, and which is most difficult to attain. A decorated canopy surmounts the light, and the groundwork is a white diaper. The whole of the glass has been painted in the old manner, and without any attempt at antiquity, but left precisely in the same state as that of the old glass, when originally executed. In all the designs a due proportion of white has been introduced, without which it is impossible to attain a brilliant effect.

Furniture.—The centre of the south side is occupied by a carved oak sideboard, of massive construction; the back is raised in panel-work to the height of several feet and supports an overhanging canopy, richly carved, and divided into arched panels by moulded ribs: these panels are diapered in colour, on gold ground. The centre compartment of the back is hung with scarlet cloth, and serves as a background to several large ornamental dishes, parcel gilt, beat up and raised into heraldic devices and bearings, with rich and varied borders, containing crests and mottoes, all referring to the house of Talbot, as they are intended for the new dining-hall at Alton Towers, now erecting by the Earl of Shrewsbury. The constructive framing of this sideboard is richly ornamented by carving of vine and hop foliage, boldly executed. The two extreme stancheons are carried up in an octagonal form, and terminated by two clusters of foliated brass branches, supporting lights. The doors of the side recesses are elaborately carved, and fitted with pierced ornamental hinges and lock plates, in the style of those so skilfully made in the fifteenth century. The sideboard is the production of Mr. Crace, of Wigmore-street. The dishes were executed by Mr. Hardman, of Birmingham.

Immediately in front of the sideboard is a large octagonal table, executed in walnut-tree. The frame and stand is designed on the strongest constructional principles, and its enrichments are only adjuncts to the necessary framing. The top is elaborately inlaid with woods of various colours, and fully proves the applicability of mediæval designs and decorations to every want of the present age. The general effect has all the richness of marqueterie, with purer forms, and a more pleasing combination of colours.

The next most striking piece of furniture is a long bookcase or cabinet. The centre doors are filled with open-wrought brass-work, of intricate foliated design, and are intended to admit a view of costly objects preserved in this compartment; the two side-doors are panelled with rich flamboyant tracery. The pieces are divided by carved and moulded muntons; and the whole is surmounted by an elaborate foliated bratishing in oak, interspersed with shields, charged with various devices. The locks, fastenings, and hinges, are of brass, and perfectly carved out in character with piercing and chasing.

Adjoining the cabinet is a praying desk, surrounded by a triptych, intended for a bedchamber or private oratory. On either side of the desk are carved corbels, supporting a pair of gilt candlesticks, ornamented with fleurs de lis, and the monogram M.R. The panels of the triptych, when open, display two miniature paintings of St. Katherine and St. Margaret, and the centre recess is richly dispersed in gold and colors. This piece of furniture has been executed by Mr. Crace, for C. R. Scott Murray, Esq., of Danesfield.

On this side of the court are several pieces of furniture, such as tables, some inlaid at top; chairs, with gilt supporters and velvet coverings; others, more simple in form, of oak, and covered with leather, but as commodious in shape as those of ordinary modern use.

In the centre is a cheval screen, consisting of a richly carved frame, decorated with the rose, shamrock, and thistle, supported by the lion and unicorn at either end, with the Royal arms.* The whole is filled with elaborate needlework, executed by a number of ladies, whose names are inscribed in scroll-work on the reverse.

At either end of this side are a piano, the cases of which have been designed in the same style as the rest of the furniture. A piano is so modern an invention, that it has hitherto been considered almost hopeless to combine its construction with old details suitable for the rooms of an ancient mansion; but the present examples fully show that mediæval detail and design is perfectly applicable to all the requirements and inventions of the day. One of these instruments is executed in oak, and is of simple character; the other is most elaborately carved and gilt, the fall painted with flowing borders, and the keys inlaid. The pianos were made by Messrs. Burns and Lambert, of Portman street.

Interspersed with this furniture was a variety of brass candlesticks, sconces, and branches for lights, either standing or projecting from the wall. They are light in design, and well adapted for the purposes, yet most original in form and effect.

In stuffs for hangings there are a great variety of elaborate and most effective old patterns executed by Mr. Crace, some ... tapestry, others in silks and of woollen stuffs, which, by their design, perfectly recall those gorgeous baudekins so often mentioned in the pages of the old historians.

* A combination, amongst many others, involving a glaring anachronism.—[Ed. C. P.]

THE MEDIÆVAL COURT.

ONE of the most remarkable features, and perhaps on the whole one of the most attractive, as a department of the Great Exhibition, was the Mediæval Court. The contents were of great variety, including furniture, and church decorations after the fashion of the Mediæval period. The forms and colours were alike singular and striking, and the general effect picturesque—perhaps a little *stagey*—but still harmonious and suggestive.

In making these remarks, and in proceeding to enter into a detailed account of this remarkable apartment, we by no means would wish to imply that we are among the votaries of Mediæval models: far from it. We consider that they have served their time, and in their time satisfied the general purposes of feeling and convenience then existing; the attempt to revive them now, however, is a mistake; the sentiments which dictated many a pious but often mistaken act of laborious decorations exist no longer. Truer principles of art and rules of taste have begun to influence society; and the decorative fancies which in real Mediæval works become curious to us as matters of comparative history, are lifeless, tame—not to say absurd—when copied in a more enlightened age.

We object to all backward movements when once we have arrived at a safe ground to stand upon; and considering that the classic models, which reached us at the period of the Revival, are to all intents and purposes preferable to the barbarism and clumsy contrivances of the middle ages, we object to abandon them until something better is offered to us in their stead. At any rate, we must strenuously resist retracing our steps from the Revival to the Mediæval; which, to speak plainly, we look upon as the culminating point of barbarism.

Nevertheless, as we said before, the Mediæval Court, tricked out in gaudy coloured draperies, in coloured glass, and glittering brass and cold monumental stone effigies, presented a striking *coup d'œil*, and deserves analytical description. The credit of the general arrangements, we understand, is due to Mr. Pugin, well known as a devotee to this style of art and contrivance.

The principal objects, many of which appear in our general view (see next page), may be described as follows,—in the language, as will be perceived, of a veritable enthusiast in Mediævalism:—

Stove.—On the north side of the court is a large square stove of remarkable character; it is composed of glazed tiles in relief, of various colours, of which a considerable number are pierced to permit the exit of the hot air. These are fixed in an iron frame, with angle shafts terminating in coronals, and small vanes of gilt metal painted with heraldic bearings. The whole is enclosed with a wrought-iron grille of ingenious construction, all the enrichments being produced by hand, after the manner of the ancient Flemish smiths, and not cast. The crockets and finials are all bent up and twisted out of thin metal, and the general effect is most striking and picturesque, reminding the spectator of the ancient stoves yet remaining in the castle at Nuremberg, and converting what is generally an unsightly object into a highly decorative adjunct to an entrance hall or gallery.

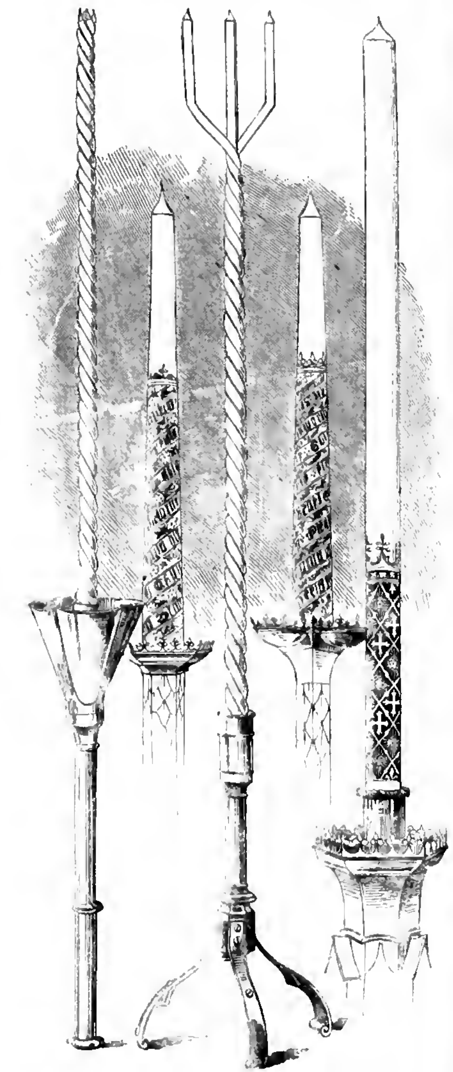
Oak Niche.—Immediately over the south-east door is a wooden niche, containing a finely carved image of St. John the Baptist; the great peculiarity of this niche consists in its being designed after the old principle, to suit the material in which it has been executed. All the enrichments are sunk out of the thickness of the stuff; there is neither mitering nor lateral projection: the cross pieces are terminated and keyed with wedges, which effectually hold the work together without glue: the canopy is also carved out of three pieces, with sunk enrichments, and crocketed with continuous foliage.

Great Rood.—In the south-east angle stands the Great Rood, intended for the loft of St. Edmund's College, near Ware. The whole is richly crocketed and foliated. At the four extremities are emblems of the Evangelists, surrounded by rich foliage-work, and on the reverse the Four Doctors. Attached to the lower portion of the framing are two pedestals for the images of the Blessed Virgin and St. John. The intermediate panels are filled with rich perforated tracing; and when the whole is arranged in its position, metal branches for lights will be affixed to the stancheons.

Stone-Carving.—Altar and Reredos.—East Side.—This altar is intended for the Lady Chapel of a country church. The subject is that of the Annunciation. The whole reredos is divided into five compartments. The two outer ones contain images of the Virgin and the angel Gabriel; and in the centre the pot of lilies, most delicately relieved in the carving, and interwoven with a label inscribed with angelic salutation. The whole is surmounted by a very rich brattishing of quatrefoils and crocketed work.

The Niche.—Adjoining the reredos is a niche, surmounted by a rich and lofty stone canopy, for the same chapel. This niche contains an image of the Virgin holding our Lord in her arms. The dignity of the Divinity is expressed in the countenance of the infant, and in his hand he bears the orb and cross. The Virgin is attired in a long tunic, and a mantle, with an enriched border, gathered gracefully into long folds; a silver parcel gilt crown, enriched with stones, is placed on the head. The image rests on a high pedestal, with highly relieved foliage, and the angle pinnacles of the canopy rest on two angle corbels issuing from the sides.

Tabernacle.—Immediately opposite the high altar is a stone tabernacle intended for the reservation of the holy sacrament. It is quadrangular at bottom, with four crocketed gablets, three of which are filled with rich tracery, and the fourth is the door, which will, when completed, be made of perforated brass. From the four angles rise buttresses and pinnacles terminated by angels with musical instruments. From this point the canopy becomes octagonal, and is connected to the square base by crocketed flying buttresses. It is raised some feet, to leave space for the monstrance



MEDIÆVAL CANDLES.

at Exposition, and terminates by a cluster of pinnacles, and niches filled with angels, of most elaborate design and exquisite workmanship. Its entire height is upwards of 20 feet.

Stone-Carving.—West Side.—Tomb of the late Rev. Dr. Walsh.—This monument, intended to be erected in St. Chad's Cathedral, Birmingham, to the memory of the late Dr. Walsh, is designed in the Third Pointed or Decorated style, and executed in a very perfect manner. The effigy is recumbent, the head supported by two angels; it is attired in full episcopal vestments of the ancient graceful form, and the pastoral staff is borne in the right hand. The minutest details of the embroidery are most carefully carved in the stone, and the whole is a *fac simile* of the actual vestments used by the deceased prelate. The effigy has a striking resemblance to those venerable and dignified effigies still remaining in our ancient churches.

depicted in the works of the ancient painters. There are also several [s]ets of the same character, full of rich colour and design, and without attempt at false relief and shadow. Over the stone fire-place a large [se]t is suspended, all the details of which, without a single architectural [featu]re, or anything that would be commonly denominated Gothic, by the [arran]gements of its foliated enrichments and the combination of colours, [po]sses a most distinct and mediaeval character.

[Ch]urch Ornaments, Metal work, &c.—A very large portion of the contents [of t]he Mediaeval Court come under this head. Immediately in front of the [..]sideboard hangs a chandelier of striking appearance and considerable [dime]nsions. It is constructed on the octagonal principle, and is composed [of a] number of shafts terminating in pinnacles passing through frames of [pierc]ed-work, fixed to a central shaft of twisted brass. From each [pin]nacle springs a succession of light foliage in the form of branches, the [end]s of which terminate in coronals and sockets supporting the candles. [Shiel]ds charged with the Talbot lion are interspersed among the branches, [and] by the colour heighten the general richness of effect. The first idea [of th]is chandelier is taken from the celebrated one at Nuremberg; but it [is la]rger in dimensions, and much lighter and stronger in construction. [It is] to be suspended in the centre of the new dining hall at Alton Towers.

[Im]mediately opposite is a large brass cornice of an early style, intended [for a] church of Byzantine character. It is composed of segments of circles [fille]d in by rich intersecting open-work, and supporting a deep rim and [cre]sting. To these are attached the standards which carry the tapers, [which] are composed of chased stems, with crystal nobs and small coronals. [The] weight of the lower crown is partly carried by chains of a very ornam[ent]al character fastened to an upper crown; and the effect of the whole [is ex]tremely rich and striking.

[Aro]und the high altar on the east side, a set of six brass pillars, about [...]et in height are erected. These pillars are highly ornamented in [the] shafts, with moulded caps and bases, and sustain six angels, also in [bras]s, with outspread wings, bearing standards with tapers; between [eac]h pillar is a brass rod with open-work bratishing, and rings from [whic]h silk curtains wove with sacred emblems are suspended. This kind [of en]closure was formerly to be found in the majority of the foreign [cathe]drals, and occasionally in our own; but bad taste and revolutionary [viole]nce have completely stripped the ancient churches of these beautiful [arran]gements, and they have been revived for the first time for the chancel [of St]. Thomas's church at Erdington, for which the whole of this work [has b]een designed and executed.

[In] front of the high altar hangs a carved beam, similar to those de[scrib]ed as having been suspended in Canterbury Cathedral and other [chur]ches. It is intended for chapels dedicated to the reservation of the [Blessed] sacrament. At the centre and extremities are quatrefoils filled with [imag]e, and to these the iron-work, by which the whole is suspended, is [attac]hed. Along the upper edge is an open cresting of brass work, sup[porti]ng bowls and prickets for tapers. To the lower side of the beam are [suspe]nded seven silver lamps of the ancient form, several of which are [enric]hed with enamels. The wick burns in a ruby glass dropped into a [silve]r collar hung from the small chains attached to the larger ones, [which] sustain the chased basons hanging beneath to receive any drippings [of oi]l. These are designed on the real principles of church lamps, and [acc]ording to the most ancient customs, and they are perfectly consistent [in for]m, and convenient for their purposes; while modern church lamps [are u]sually made like huge bowls full of emptiness, with a glass stuck in [the t]op of them. The beam and its appurtenances are a most satisfactory [revi]val of one of the most beautiful ornaments that formerly decorated [our a]ncient churches.

[Aro]und the high altar are placed several high standing candlesticks, ter[mina]ting in branches and coronals for lights, intended for the elevation or [bene]diction. There are also six silver candlesticks on the altar, of twisted [and c]hased-work rising from octagonal bases, ornamented with crystals and [gem]s. The flowing of this design is particularly well adapted to the metal, [and th]ey produce an infinite variety of bright and reflected lights.

[Th]e candles themselves are remarkable amongst the revivals of the pre[sent a]ge. We give a sketch of some of them, together with some notes of [the r]ites of the Romish Church, to which they have reference. The large [cand]le, which is called a "Paschal Candle," is intended as symbolical of [the g]lory of Christ's resurrection. It is lighted during the offices of the [chur]ch from Easter to the Ascension. It is elaborately painted round the [shaft] with various inscriptions and devices. The triple candle, which is [comp]osed of three equal parts twisted together, is used on Holy Saturday [for th]e "Lumen Christi," in the procession from the church porch. The [paint]ed torch is a revival of those borne on various occasions in the middle [ages], especially at funeral processions and entertainments. The custom of [adorn]ing candles for sacred purposes, by painting and gilding, is very [ancie]nt; and the same principle was formerly carried out with regard to [torch]es for domestic use in great feasts, these being painted with heraldic [devic]es. On the eastern side of the court are two glass cases filled with silver [plate] and jewellery: that on the north side is devoted to ecclesiastical [orna]ments, and the opposite one is filled with secular plate, jewels, &c. In [the fo]rmer there are several richly enamelled chalices of the ancient form, [with] chased perforated knops of intricate design and hexagonal feet most [richly] chased and decorated with enamel and precious stones. There are [two m]onstrances of elegant design, but of very different character. The [first i]s a circlet of rich tracery, like a crown supported by a high stem, and [surro]unded with enamelled quatrefoils representing cherubim in adoration.

The second is like an open spire or canopy of octagonal form springing from four pinnacled shafts, supporting in the centre a cross. The execution of this, even to the minutest details of its crockets and pinnacles, will bear comparison with some of the best works of the old silversmiths, and may be considered a great advance in the revival of this art. On one side of the same case is a pastoral staff for a bishop, enamelled, crocketed, and containing several images in the crook, under canopied work. The case also contains some richly enamelled pyx, candlesticks, crosses, bindings of missals, and a variety of other ornaments most elaborate in detail.

The opposite case, devoted to secular plate, contains a variety of specimens of candlesticks, salt cellars, dessert services, flagons, &c., of simple form, but designed in the metallic feeling which may be discerned in the productions of the ancient silversmiths. The effect is produced by beating-up and engraving. There are no cast ornaments of heavy foliage, but the nature of the material is well-considered in the designs, and has a great effect in production at a comparatively small cost.

There are several trays of jewels, the setting of which is according to the old Venetian manner, the stones being almost detached and held by points, by which a transparent effect is obtained. The specimens consist of crosses, bracelets, necklaces, brooches, rings, and a girdle. The casket made to contain them is exceedingly elaborate, and of elegant design, with enamelled lock and heraldic devices.

On the opposite side of the court are two other cases containing church vestments, made after the ancient form, which has been recently revived, and presenting a pleasing contrast to the modern stiff and buckram *chasuble* of France. The laces which form the orphreys are adapted from ancient examples, and a great variety of these are exhibited on the sides of the cases. There is also an albe with the ancient apparel as seen in the habits of ecclesiastics on tombs and sepulchral brasses, and two copes, one of which is of white cloth of gold. There are also a variety of stoles, maniples, and chalice-veils, in the same case.

Adjoining are three lecterns. The first is designed with two branches, separating from a solid stem (the base), and supporting two kneeling angels, who carry a perforated tracery panel to receive the book. The second is a large eagle, with outspread wings, resting on an orb supported by an hexagonal pedestal of open tracery-work, from whence spring three flying buttresses, resting on pinnacled shafts, surmounted by half images of angels bearing scrolls. The base is very massive, and rests on three lions couchant. Two large foliated branches are attached to the shafts and carry tapers, to afford light to the *lector;* these branches are moveable, and may be adjusted at pleasure. This noble lectern was presented to St. George's Church, Southwark, by the Rev. D. Haigh, of Erdington.

The third lectern has been designed from an ancient example at the Cathedral at Courtrais. The desk is perforated with a device of the holy name spread out into flamboyant tracery; the shaft is terminated by an image of St. John the Evangelist.

Opposite these, and in front of the niche, is placed an iron candlestick, of wrought-work, which turns on a centre, and is intended to receive offerings of tapers for the Lady Chapel of St. Augustin's Church. This is a most elaborate piece of iron-work, worthy of the ancient smiths, and is a striking proof that our operations, when under proper directions, are quite capable of representing the most beautiful works of mediæval skill. Near this is a a credence-table of wrought brass, with a marble inlaid top, and many other objects connected with church decoration, all from the workshops of Mr. J. Hardman, of Birmingham.

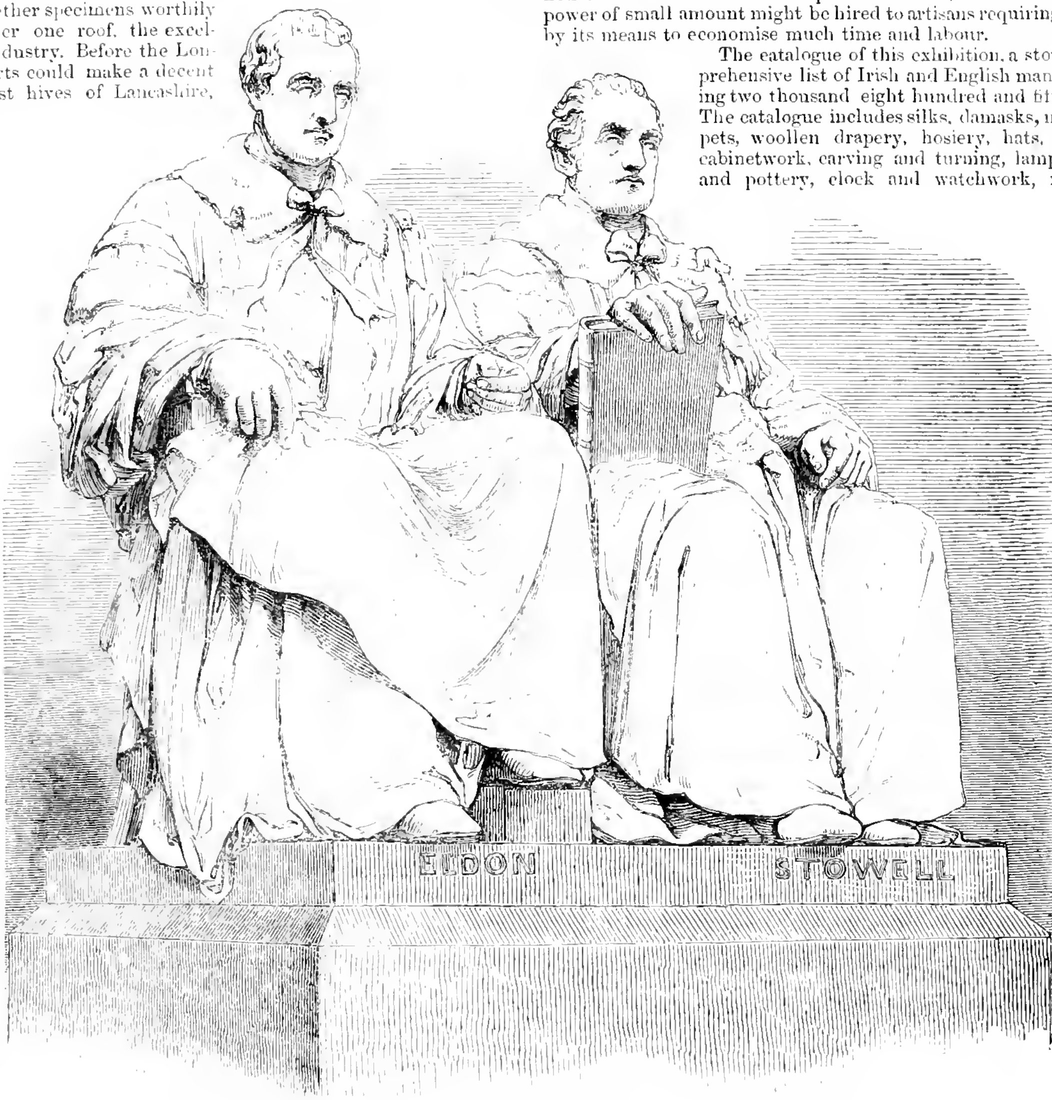
Instruction for the Blind.—Among the many interesting objects which attracted the notice of the visitor to the Great Exhibition, not the least was the display of raised and embossed works deposited in the building by the Society for Teaching the Blind to Read, together with specimens of the different kinds of apparatus used in the school, and of articles of work made by the pupils. Although these articles do not compete in outward appearance with many of the more beautiful and showy objects with which they were surrounded, still, for their practical utility, and the illustration they afford of the successful adaptation of educational means to the wants of a peculiarly interesting class, they must not be lightly passed over by the philanthropist. A blind pupil was in attendance almost every afternoon, and gave a practical proof of the value of the system adopted, by reading any portions of Scripture, or pointing out any place or country upon the map which he might be required to do. The articles exhibited included a number of embossed books upon Lucas's system of short hand, cyphering boards, and raised maps; apparatus for enabling the blind to write in Lucas's characters, so that their writing can be read by each other; and specimens of embossed music—Lucas's characters being adapted to musical notation, the advantage of which is that no new type is required for the object. The music can also be written by means of the writing apparatus already mentioned. There were likewise a chess-board and geometrical boards adapted for the use of the blind, and specimens of basket work and knitting—the work of the pupils at the institution. We are happy to hear that this admirable institution has been the means of affording instruction during the past year to 53 female and 29 male pupils, 14 of whom are adults. As an instance of the practicability of the plan adopted for the notation of music, and of the facility with which it may be acquired by the blind, we were informed of a case in which, when music embossed on this plan was placed for the first time in the hands of the pupils, several of the girls detected and pointed out a false note in the printing, which had previously escaped notice.

HISTORY OF INDUSTRIAL EXHIBITIONS.

VII.—The Exhibitions of Ireland.

BRITISH manufacturers were almost the last in Europe to recognise the utility of industrial exhibitions. Even Spain had organised a national exhibition of industry, before even the societies established in Ireland and London for the encouragement of arts and manufactures could gather together a decent collection of the products of native looms, potteries, and foundries. To the Royal Dublin Society, established so far back as 1732, is indisputably due the honour of having first gathered together specimens worthily representing, under one roof, the excellences of Irish industry. Before the London Society of Arts could make a decent show from the vast hives of Lancashire, Cornwall, and Yorkshire, a collection of manufactures was brought together in Dublin of the most interesting and useful character. From that period up to the present, similar exhibitions have been held triennially, and always with increased success. In the face of those disastrous events which would have paralysed a less hopeful people, the Irish have steadily supported their triennial exhibitions. The vigour with which the Royal Dublin Society has pursued the enlightened object for which it was founded is unequalled, save by that of our London Society of Arts. These two societies have now, for more than a century, in conjunction with the Scotch Board of Trustees for the Encouragement of Manufactures, been actively engaged stimulating manufacturers to high achievements, and endeavouring to gather from abroad, for the benefit of the great native community, those results of experience which are accumulating for the future benefit of mankind in every country where industry is systematised. With their various successes the country is familiarly acquainted. The industrial exhibitions of Ireland, however, deserve particular attention at the present time, as they date further back than any held either in England or Scotland. Up to 1850, the contributors to the periodical exhibitions of the Royal Dublin Society were exclusively Irish: but in this year the authorities extended their plan, and called upon foreigners to compete with their countrymen. This exhibition was the finest and most promising of the series. The committee, or jury, refer in their report with particular satisfaction to the vast extent and splendour of this exhibition; and they claim for their society the distinction of having been the first to "open their honours and prizes for competition to the manufacturers of all countries, and to invite them to meet in honourable rivalry" within the walls of their institution.

The hopeful tone of this document suits well with the present aspect of commercial affairs. The committee tendered their acknowledgments to the English exhibitors of machinery, who, "regardless of cost and personal inconvenience, and undeterred by distance, succeeded in maintaini action so many beautiful examples of manufacturing engines, by whic importance of the exhibition was so much enhanced." They also con lated the committee of manufactures in having thus not only show great advantage of employing steam-power as the prime mover of machinery, but in having demonstrated to the working-classes the in ance of employing "this most important agent" as a substitute for apparently more simple motive powers; and they trusted that the e ment made by the committee of impelling a number of different mac through the medium of a shaft and pulleys, by one small steam-e might suggest to some spirited individuals the practical importance of h houses established in different parts of Dublin, in each room of which s power of small amount might be hired to artisans requiring it, to enable by its means to economise much time and labour.



THE STOWELL AND ELDON GROUP.—BY THE LATE M. L. WATSON.—(SEE PAGE 221.)

The catalogue of this exhibition, a stout octavo, is a prehensive list of Irish and English manufactures, nu ing two thousand eight hundred and fifty distinct ar The catalogue includes silks, damasks, muslins, linen pets, woollen drapery, hosiery, hats, leather, oil- cabinetwork, carving and turning, lamps, glass, por and pottery, clock and watchwork, machinery, hangings printing, absence raw mat was the ed defe the colle of the da we give cimen, - Portland Pattern, was exh by Mr. ning, of ingstown some ve specime printed brics for dresses, ward for the s awarded medal t manufac Irish p and Iri nens w markabl for wor ship an sign. In the wov textile f exhibite so gen good, th jury fou difficult ter to d between petitors. der the h silks, tab velvets, some ad ble specimens were exhibited by the principal firms of Dublin; and gold medals were distributed among them. The manufacturers of U exhibited damasks and cambrics which will enable them successfully to pete with the manufacturers of France, Germany, and the Netherl "even in the home markets of these latter."

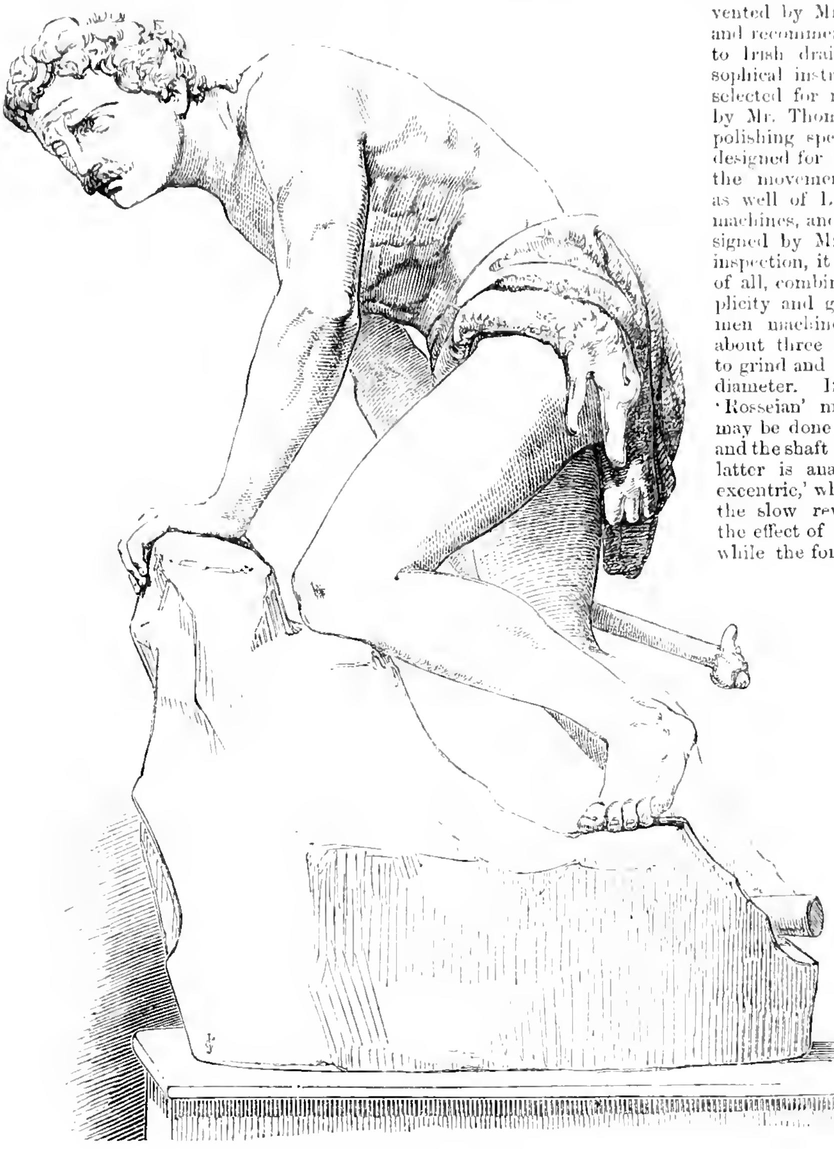
The articles offered for competition were divided into four sections. first comprehended all raw materials and produce. Under this head no beyond a few samples of prepared peat, peat charcoal, iodine, flax yarn leather, was contributed: this department was, as has already been obse the weakest of the exhibition.

The second section comprised manufactured articles. This section w doubtedly the most important and interesting of the four; and the jury red with pride to the number of articles of Irish production, excellent in d and manufacture, which it included. Under this section we find the nan many eminent English firms; among others, Messrs. Elkington and Mas Newhall-street, Birmingham, gained a gold medal, "for the design and e tion of electro-plated articles;" while in the department of "porcelain, c glass, delf, &c.," the winners of certificates were nearly without an exce Manchester and London firms. Furniture, matting, saddlery, perukes, c soap, candles, ricks, blacking, umbrellas, lozenges, confectionary, and pe ery, were represented chiefly by Dublin firms, under the head "Miscellane

e third section was devoted to "machinery, mechanical contrivances, and els." Department A of this section comprehended separate parts of ines. Although little was exhibited in this sub section which could be ly considered new, still it included several improvements in machinery n deserve notice. In the list of these improvements, a new railway on buffer, invented by Mr. Wilfred Haughton, of the Dublin and stown Railway, merited particular attention. This machine, according e jury, is intended to be used at railway termini and sidings, as a uard in the event of a train being brought in at too high a velocity. simply a sledge, in orm of two inclined s, resting upon the and of the same gauge. o inclined planes, united together by rods, form one ma, upon which the locoe engine, in the event train overrunning its ce, will ascend, and ront wheel or other nient part of the e coming in contact a stop placed at the of the sledge, this is carried forward with the engine, the e weight of which is made effective in prog friction between the e and the rails, and stroying the motion of ain. The chief adge which the friction possesses over the g buffer in ordinary s, that there is no r of recoil, and that ost is inconsiderable. ry tested the efficacy r. Haughton's invenand were so satisfied t, that they awarded gold medal, value 5*l*. new furnace-bar was g the inventions noby the jury. This bar, ved by Mr. Richard son, of Belfast, applies rinciple of the hot to ordinary furnaces; e jury declared that ciency in promoting ustion was very rebly shown at the ition. Owing to a ncy of chimney draft, s found impossible, g the first few days of Exhibition, to raise ent steam to drive x-dressing and other nery in the temposhed: but, after Mr. bson had substituted of his bars, this was altogether rel, and the supply of increased at a rate too rapid rather than too slow. From the lightness material used in these bars, it might be supposed they would be speedily burnt out, but the constant current of the air through the events this result. This was clearly shown by observing the action fire on the bar when the damper was closed or open. In the former the whole bar became red-hot, but immediately on opening the r, and thus permitting the passage of the current of air, the bar was ed immediately to cool down, and to continue cool.

he second sub section, that devoted to "machines for raising and g bodies, steam-engines, carriages, ships, boats, &c.," Messrs. Grendon, gheda (the first manufacturers who constructed locomotive engines land, for sale) exhibited a light passenger locomotive steam-engine. linders of this engine had a diameter of nine inches, with a twelvetroke, and the steam valves were wrought with the new patent e expansive link motion. The diameter of the driving wheels was that of the trailing wheels, 2 feet 10 inches; and the engine was structed as to carry sufficient coke and water for a journey of twentyiles, at a speed of forty miles per hour. The advantages which it sed over the engines in general use, as stated by the Messrs. Grendon, were, its not consuming more than one third of the ordinary quantity of coke, and from its lightness causing much less injury to the permanent way. For this, and other specimens of machinery, the jury awarded to the firm a gold medal, value 5*l*.

In the department of pleasure carriages there were many exhibitors, and especially builders of all kinds of improved jaunting cars. Sub-section 4 included "models and drawings, exhibiting the application of mechanical contrivances, &c." Amongst these were a model of a stationary engine, executed by Master Alfred Oldham, Rathgar, Dublin, aged fourteen; and a model of a patent brick and tilekiln, invented by Mr. John Ridgway, Staffordshire, and recommended as an admirable auxiliary to Irish drainage. From the list of philosophical instruments exhibited, the jury selected for notice a machine constructed by Mr. Thomas Grubb, for grinding and polishing speculums. "This machine was designed for the purpose of uniting in one the movements (or rather the resultants) as well of Lord Rosse's as of Mr. Grubb's machines, and also of a machine lately designed by Mr. Lassell, of Liverpool. On inspection, it appeared to unite the powers of all, combined with the advantages of simplicity and great compactness: the specimen machine exhibited, which measured about three feet each way, being adequate to grind and polish a speculum of two feet diameter. If it be desired to obtain the 'Rosseian' movement in this machine, it may be done by turning the endless screw, and the shaft moving the vibrating arm. The latter is analogous to Lord Rosse's 'first excentric,' while the former produces both the slow revolution of the speculum and the effect of Lord Rosse's second excentric: while the fourth movement required, viz., the slow revolving of the polisher, can, in the present machine, be readily governed (if found desirable) by giving a corresponding motion to the spindle of the vibrating arm. To obtain Mr. Lassell's movements (which are a series of cycles or epicycles concentric with the surface of the speculum), the vibrating arm is fixed at an excentricity equal to the radius of the required circle of epicycloids, while the crank-pin of its revolving spindle is set to the radius of the epicycles themselves: this spindle and the speculum being thus kept simultaneously in motion, will produce the desired combination of movements. The peculiar advantages of this machine may be stated as follows:—First, in giving, with the simplicity of Lord Rosse's machine and greater simplicity than Lassell's, the movements of both; and not only this, but also the passing without loss of time from one method of working to another at pleasure. This is the more important, if, as we conceive, Lord Rosse's movements are best suited for grinding, and perhaps the early part of the polishing, while Mr. Lassell's appears good for the latter stages of polishing, particularly of mirrors of large *angular aperture*, and where the centre is removed, as in the Gregorian or Cassegrain mirrors. Second, by an evident combination of the several movements of which the machine is capable, those actions which produce the parabolic curve can be made to act continually in excess over *the same portion* of the circumference of the mirrors, from which there can be obtained at least an approximation to that peculiar elliptical figure which is still a desideratum for making a good front-view telescope."



THE ANCIENT BRITON LOOKING OUT AS A SCOUT. —ADAMS.—(SEE PAGE 224.)

It will be seen, from the variety of articles severally representing distinct departments of human industry, that the Dublin exhibition could fairly lay claim to the title of national. All the eminent manufacturers of the island figured in it, and not a few of those English firms whose fame is European were glad to place their products in juxta-position with those of their Irish neighbours. On all hands, the management of these triennial bazaars received hearty co-operation from manufacturers.

MINING AND METALLURGY.

THE NATIVE METALS AND METALIFEROUS ORES.

MANY remarkable and highly interesting specimens of native metals and metaliferous ores were exhibited in various parts of the Crystal Palace, which may be referred to with advantage, as giving valuable information to those desirous of acquiring it on a very important subject. We propose to detail a few of these, with such information as may render them more useful.

One of the first of such specimens worthy of notice was the noble pebble of pure Gold, from California, exhibited in the South-west Gallery, near the gems of Messrs. Hunt and Roskell, and amongst various articles of jewellery and plate. This block, weighing above 18 lb. and worth nearly £800, excited surprise at first by its apparent smallness; but it must be remembered that gold is one of the heaviest substances known, weighing nearly twice as much as a piece of silver of the same dimensions, and more than six times as much as a common pebble exactly identical in form. Gold, till within the last few years, was obtained almost entirely from Siberia and Brazil, although Africa, the East Indian islands, and even some parts of Europe, yielded certain supplies. No metal is, in fact, more widely diffused through the earth than this, which is so highly prized and often thought so scarce; but the quantity of a material is not necessarily coincident with its wide diffusion; and while there are, perhaps, very few known districts throughout the earth in which gold might not be found by seeking, yet, in most cases, the search would be so costly, that the material, when obtained, would not at all repay the trouble of getting. Still, large quantities have been introduced into Europe annually for a long time past, and it is a great proof of the wide use of the metal, that its price has not yet been affected by all the additions that have been made. The average annual supply for some years before the discovery of the Californian mines and washings, was about 80,000 lb. avoirdupois, the value being about five millions sterling. This is now, perhaps, doubled; but hitherto the demand has fully kept pace with the supply. Besides the large block already noticed, which was discovered and brought home by an Irishman who was on the point of leaving the country in a state of hopeless destitution, when he was lucky enough to turn out this single but valuable pebble, there were several other samples of Californian gold, chiefly exhibited amongst the goods of the United States. They are all nearly pure and have hitherto been obtained, with very rare exceptions from amongst the sand and gravel washed down by torrents from the adjacent mountain country, and accumulated in depressions or natural receptacles, where the progress of the water has been somewhat checked, and the weight of the gold caused it to sink down sooner than the accompanying stones. The largest specimens of gold yet found are from Siberia, whence several lumps exceeding 15 lb. weight have been obtained; and one lump in 1843 weighing no less than 78 lb. avoirdupois and therefore worth about £5000. In all gold districts, however, such discoveries are rare, the general condition of the produce being rather that of small grains sparingly distributed through sand and rock, and requiring considerable labour to extract and separate. It is estimated that the sands of a river will just pay for gold-washing, if they contain at the rate of 24 grains per cwt. of sand. The uses of gold are too well known to require much account. An interesting series of manufactured and beaten gold was exhibited in Class I., near the Sculpture Court; and also a series of metallic buttons, showing the different colour and appearance of gold and other metals when pure and alloyed for various purposes.

Amongst its uses, the peculiar quality of gold to bear almost any amount of hammering, and yet retain a perfect cohesion in almost any conceivable state of thinness, is perhaps, the most remarkable and important. Owing to this, gold leaf can be produced so thin as to be introduced for the cheapest and commonest purposes, and the great beauty and indestructibility of the metal are taken advantage of in innumerable cases where otherwise its costliness would render it unattainable.

Silver, like gold, is found sometimes native; but this is not the most common form in which the metal occurs. There were, however, some very noble specimens of native silver in the Exhibition, the most interesting being a large block from Chili, weighing upwards of 150 lb. avoirdupois. This, though not quite the largest, is one of the finest lumps of native silver yet brought to this country, and is valued at about 600*l*. Some other extremely beautiful specimens, in a very different state, were exhibited from Norway, and were well worthy of examination, from the crystalline and semi-crystalline condition in which they appeared.

Silver is not so widely distributed as gold; but is far more abundant and its uses more numerous. Mixed with a small quantity of copper, to give it hardness, it enters so largely into use as a coin and for plate, that the consumption and waste from these sources alone must be enormous; but it is also much used in the arts for various purposes, in chemistry and medicine, and lately for electrotyping. The value of the silver annually introduced is estimated at upwards of eight millions sterling; bu[t the] relative value of silver to that of the necessaries of life does not greatly [...]

Near the specimens of gold leaf already alluded to in Class I., [were] found a very interesting series of rare metals, exhibited by Mr. Pe[rcival] Johnson, and including some manufactured articles (No. 477.) Of [these] metals *Platinum* is the one in most general use, and is of great impor[tance] in various cases where a material is needed which will resist any k[ind of] furnace-heat without being affected by acid vapours and without de[com]posing the atmospheric air.

Platinum is found native in Brazil and Siberia, generally in small l[umps] but sometimes in masses of considerable size. Its weight is greater in [pro]portion even than that of gold, and it is in fact, when hammered, [the] heaviest substance known. It bears welding like iron, and can th[us be] manufactured without difficulty, as it is also very malleable. Se[veral] chemical utensils made of it were exhibited by Mr. Johnson, and ther[e was] a very remarkable platinum dish among the French goods.

In the same case with the platinum were specimens of *Palla[dium]*, *Iridium*, *Osmium*, and *Rhodium*—metals for the most part extremely [rare] and but little used in the arts, but some of them at least worthy of n[otice]. Palladium is more common than the rest, and has lately been employ[ed in] electrotyping, for which it seems admirably adapted, as it resists exp[osure] as well as gold, and is far better fitted for various purposes than silv[er or] platinum. In the manufacture of philosophical and surgical instru[ments] especially, this metal may be used with advantage; and it has [been] employed in dental operations. Iridium and rhodium are chiefly us[ed at] present in making nibs for pens, a purpose for which their hardness [and] indestructibility are useful qualities.

Various interesting samples of *Mercury* and its ores (chiefly cin[nabar]) were exhibited, from Austria, Spain, and America. The former came [from] the mines of Idria, long known and much worked, and yielding at one [time] large supplies. The specimens from Spain were from the equally [well-]known mines of Almaden; while the American ones were chiefly [from] California, where considerable accumulations of this mineral seem to [exist,] though hitherto they have been little worked. Mercury is the sou[rce of] the vermilion colour used in dying, and is a metal of considerable int[erest] on account of its fluidity at ordinary temperatures.

Very fine specimens of native *Copper* were exhibited, both from our [own] country and elsewhere, together with numerous ores of that useful m[etal]. Among the former, Mr. Berger sent some very fine pieces obtained fr[om a] mine in the serpentine rock of Cornwall. Other native coppers well w[orthy] of notice came from the shores of Lake Superior, where a mass of gig[antic] proportion (estimated to weigh 80 tons) was discovered some time [ago], but, owing to the want of sufficient means of communication, it is bel[ieved] that it still remains, and is of comparatively little value. A large frag[ment] of this was exhibited by Mr. Tennant. Besides these, many of the o[res of] copper were shown, especially the rich and valuable carbonates from S[outh] Australia; the poorer but still not unimportant sulphurets from Cor[nwall] and other parts of the British islands; and some less common but int[erest]ing ores from Austria, France, Germany, Spain, and South Am[erica]. Russia also sent some contributions of great value in reference to [this] metal, especially by providing several magnificent blocks of mal[achite] (green carbonate of copper), more adapted for ornamental work tha[n for] reducing to metallic copper. A large and beautiful vase of hamm[ered] copper should also be noticed, as illustrating both the purity of the [metal] and the excellence of the workmanship.

Lead is never found in the native state, or at least is so rare as to [be of] no value in that respect in the arts. The common ore of lead is a c[ombi]nation with sulphur called *galena*, of which several very noble specimens [were] exhibited near the eastern extremity of Class I. by several persons, am[ong] whom we may especially notice Mr. Sopwith and the Alston-Moor m[ines,] Mr. Pattinson, and various exhibitors from Wales, Scotland, Ireland [and] the Isle of Man. In most of these cases, the ores in the rough state [were] the chief objects of interest; but two or three remarkable excep[tions] occurred, in which the complete history of the manufacture of the met[al, or] some part of the process, was more distinctly indicated. Thus, Mr. Sop[with] showed samples of lead ore in every stage of preparation, from the r[ough] undressed material as it was brought up by the miner from the bowe[ls of] the earth, through the modifications it undergoes by crushing, wash[ing,] roasting, &c., until at length it is reduced by smelting to metallic lead. [In] that state it is still alloyed with a certain percentage of silver which, i[n the] case of the poorer ores was till lately left with the lead, as the mea[ns of] separation were too costly to be repaid by the silver extracted and the h[igher] price obtained for the purer metal. Now, however, by the method inve[nted] and exhibited by Mr. Pattinson, advantage is taken of the tendenc[y of] metals to separate while one is undergoing crystallisation by slow coo[ling;] and, by means of long ladles, resembling a perforated sugar-coop [on a] gigantic scale, the lead, while granulating, is removed from the more [fluid] part of the molten mass, which is thus left with a gradually increa[sing] proportion of silver, till at length it is so rich that the lead may, wit[hout] serious loss, be allowed to become oxidised in an absorbent crucible, w[hile] the silver remains as a kind of button, of which one specimen was sh[own] weighing about 12,000 oz., and several others were also exhibite[d of] somewhat smaller proportions, but still sufficiently remarkable to [call for] special notice. The beauty of this process renders it well worth[y of] attention, and the whole was fully illustrated by a series of diagrams [and] specimens, and a printed account, which was to be obtained by any[one] visiting that part of the Exhibition.

inc is a metal of considerable interest at present, and was admirably ...trated, in various ways, in the Exhibition. Most of the zinc of commerce ...ter) is obtained from the ore called calamine (carbonate of zinc), ...edingly abundant in Belgium and Silesia, but also found extensively ...e Mendip Hills, in Somersetshire, in Flintshire, and Derbyshire, and ...r mining districts of the British islands, and elsewhere in Europe, ...and also contains large quantities of blende or black jack (the sulphuret), ...is capable of yielding a very large supply, though at present the ...rial is hardly worth working. Zinc is now used extensively in various ...tructions, and for domestic and farm purposes; but its applicability ...astings on a large scale was also fully proved, by the numerous ...irable works exhibited in the Nave and elsewhere. A block of zinc ...pied a prominent place amongst the American goods, and was further ...trated by a series of slabs and panels, painted with a material in which ...takes the place of the lead generally used by ... (as white lead or ...e) as the basis of all oil pigments. Owing to the injurious effects ...ng to painters and others employed in the frequent handling of white ... it is most desirable that this material should be, if possible, replaced ...less mischievous substance, and thus the subject assumes an importance ...h would not otherwise belong to it. Zinc was very extensively exhi... ...d by the Vieille Montagne Company of Brussels and Paris, who work ...argest and most important mines of this metal; and the efforts made ...ing forward the metal and apply it to useful purposes of various kinds ...worthy of very special remark. We need scarcely do more than mention ...great value of zinc combined with copper in the manufacture of brass.

...in is a rare metal compared with many others, and is usually found ...in the form of tin-stone (an oxide). It is obtained principally from ...wall and the islands of the Indian Archipelago; and each of these ...ricts sent samples of their produce in this respect. The specimens from ...own country consisted partly of what are called "stream ores," or ...d pebbles of tin-stone, worn by the action of water, and mixed up with ...and gravel, and partly of portions of tin veins, of which there were ... interesting specimens, showing the general form, character, and ...t in which the ore exists in the parent rock. In addition to these, ...models of much interest, illustrating the mechanical mode of separa... ...the heavier or metaliferous particles from their earthy associates; ...also models of the smelting establishments where the tin is first ...ced and then refined, so as to be in a condition fit for use by the ...er in metals. Tin is but little employed as a metal directly; but, as ...xes freely with several other metals, forming valuable alloys, it is often ...in the arts. The alloys with quicksilver for the backs of mirrors, with ...er to form bronze and bell-metal, with antimony in the manufacture ...rd pewter, with antimony, bismuth, and copper for Britannia-metal, ...with the same metals combined with lead for type metal, are examples ...e uses which will at once show the importance of the subject. In ...ng, the use of tin is not less remarkable as the common tin-plate, which ...sts of sheets of iron dipped in tin, and the method of lining copper ...ls with tin for culinary purposes, will sufficiently illustrate. The salts ... are extensively used in dying and calico-printing, and in many other ... where the colours obtained from them are required.

...ckel is a metal not used by itself, but very important in the manufac... ...of several alloys, well known under various names as imitations of .... German silver, argentine and other white metals, are thus formed ... admixture in certain proportions of several metals, of which copper, ...l and zinc are essential ingredients. Nickel is generally found in ...e associated with *Cobalt*, or white metal, not used except in its earthy ... in which it affords a blue pigment of extreme value for its beauty ...ermanence and greatly used in all encaustic work of whatever kind ...e the colour has to be burnt into any surface and requires therefore ...nd exposure to a very high temperature. Nickel and cobalt are not ... so extensively in England as in Germany, Norway, and other mining ...cts on the Continent, from which the greater part of the supply is now ...ied. Good specimens of both metals and of the oxides of cobalt ... of commerce), and the blue glass called *smalts* used extensively as a ...ring material, were exhibited from Saxony (Nos. 9 and 10) and some ... countries of the Zollverein, highly illustrative of the nature of the ...ial and the uses to which it is applied. Specimens from Cornwall ...exhibited in Class I. (British) 511 and 512.

...muth, of which a very beautiful specimen was exhibited on a table on ...outh side of the Nave, near the Austrian department, is a metal, ..., like nickel, is not used alone, but has considerable value in mixing ...other metals, the effect being to render the alloy more fusible. It is ... chiefly in Saxony and associated with cobalt, from which it is sepa... ...by a peculiar process of distillation. Lead and tin, combined with ...th in various proportions, and with the occasional admixture of ...r, antimony, and other metals, are used in the arts for various purposes ... manufacture of type metal, plumber's solder, pewter, and fusible ... being the principal. The oxides and salts of bismuth, being chiefly ...trate, are used in dying and calico-printing.

...imony, like bismuth and nickel, is not used alone as a metal, although ...bundantly distributed and easily obtained in the metallic state. Very ...specimens of the different conditions of antimony ore (sulphuret) ...different localities, and metallic antimony, were exhibited by Mr. ...t in Class I. No. 481), and some of these showed the crystalline form ...ch the surface may be obtained. The ore of antimony in a state of ...owder is used in the East to stain the hair, and the salts are used in ...ine and dying. The metal itself is employed in various alloys, some of which we have already referred to. Amongst other applications not mentioned is that of antimony and lead to produce a harder sort ... than lead, used in engraving music. The combinations of antimony with other metals are usually more brittle than the metals employed.

Arsenic is found native, and is very abundantly distributed with the ores of several other metals, but, though extensively used in the arts and in medicine, it is not itself employed directly in the metallic state. In combination with other metals it is frequently present in small proportions, and it is an important ingredient in common shot, the lead running into round drops much better with a proportion of arsenic than without it. Specimens of the oxide of arsenic (white arsenic), as obtained from tin furnaces, were exhibited in Class I. by Mr. Garland (...); and as this form is the one most commonly employed in the arts and in medicine, it deserves to be noticed. The sulphuret of arsenic, *orpiment* or King's yellow; and *realgar*, a fine orange red pigment, are a good deal used in giving colour in various ways.

Uranium and *Cromium* are two metals rarely or never seen in the metallic state, but not without considerable importance in the arts (especially the latter) as affording valuable pigments. Uranium, and its salts and oxides, were shown by Mr. P. Johnson, in his case already alluded to (No. 477), and chrome ores and oxides were exhibited by one or two British exhibitors, but chiefly from our North American colonies and India. The case exhibited by the Indian Iron and Steel Company, near the Transept, contained a very good series, showing the colours obtained from the metal.

Tungsten is another metal not used at all in the metallic state, of which the salts are employed occasionally, chiefly in dying and calico printing. The separation of wolfram (tungstate of iron) from tin, with which it is often mixed in Cornwall, is a troublesome and tedious process, and was illustrated by a series of specimens exhibited by Mr. Oxland (No. 485).

Manganese is a metal only valuable in combination with oxygen gas (as an oxide), and in this state it is generally and very abundantly presented in nature. Samples of it were shown in various places in the Exhibition, but they do not require any special notice. They are employed in bleaching to a large extent, are used as a coarse pigment for pottery and also in glazing pottery, and come into use in the manufacture of glass.

Iron, the most truly valuable of all our metallic produce, and the source of all our wealth, formed the subject of an article in our second number, page 18.

SHIELD OF THE ARMS OF ALL NATIONS.

The shield engraved in page 211—copied from an enamel which formed one of the ornaments of the Fine Art Section—gives the arms of all those nations which indulge in the luxury of heraldry. This beautiful work was designed and executed by Mr. Bass, of Great Newport street. The colours of the various nations exhibiting their productions in the Crystal Palace were also arranged along the principal avenues; it may be interesting, therefore to give some account of these colours, which we extract from Mr. Timbs's extra volume of the Year-Book of Facts for 1852,* a volume which we may recommend as the most complete and carefully digested compendium historical and descriptive, of the Great Exhibition, which has yet come before us in a portable form:—*Switzerland:* A flag, white with a red cross.—*France:* A tricolour flag, blue, white, and red. This is the celebrated standard which was established during the first terrible French Revolution, the standard which waved over the victories of the Republic and the Empire, and which was displaced during the temporary restoration of the Royal House of Bourbon, the old white flag, "la bannière sans tache," being then restored. At the Revolution of 1830 the tricolour was brought back again, and it has ever since continued the national standard of France.—*Belgium:* A tricolour, black, yellow, and red, the national standard adopted by the Belgians at the formation of their new and happy monarchy in September, 1830.—*Austria:* Black and yellow banner.—*Zollverein:* Banner, white and green; another, blue and red.—*America:* The celebrated star-spangled banner and arms of the Republic of the United States, which may be blazoned thus: Paly, ar. and gu., a chief az., semé of stars, or. *Crest*—an eagle. *Motto*—"E pluribus unum."—*Spain:* A flag, per pale, red, yellow, and red, bearing the arms of Spain upon it: quarterly 1st and 4th gu., a castle triple-towered, or, for Castille, 2nd and 3rd az., a lion rampant crowned, gu., for Leon, over all, on an escutcheon of pretence, az. three fleurs-de-lis, or, for France.—*Italy, Rome:* A white flag bearing the Tiara, and Keys crossed in saltier, emblematical of the Papal dominion. —*Italy, Sardinia:* Banner, green, white, red; charged in the centre with the arms, az., a cross, gu.—*Greece:* A flag bearing the arms of the Greek monarchy, az., a cross, ar., over which an escutcheon bendy-fusilly of twenty-one pieces, ar. and az., for Bavaria.—*Turkey:* Az., a crescent and star of eight points, or.—*Denmark:* Banner, red, charged with a white cross.—*Russia:* Banner, blue, charged with a yellow cross; first quarter a cross, blue and yellow, quarterly saltire-wise, blue, and red.—*Portugal:* Banner, blue and white, charged with the arms, ar., five shields, cross-wise, az.; on each five plates saltire-wise; on a bordure, gu., seven castles, or.

* Extra Volume. The Year-Book of Facts in the Great Exhibition, 1851: its origin and progress, constructive details of the building, the most remarkable articles and objects exhibited, &c. By John Timbs, author of the "Arcana of Science and Art." Post 8vo. D. Bogue.

THE RUINS OF THE LATE "GREAT EXHIBITION."

(FROM THE OBSERVER, DEC. 20.)

The process of clearing out the vast pile in Hyde-park still goes on—to a spectator apparently with great energy and activity—but, if we may judge of the results at the end of each week, with incomprehensible slowness. This arises from the difficulty of measuring the effect of the continuous labour of 200 or 300 workmen by a reference to any ordinary standard. We see hourly vans and waggons heavily laden, from morning till dusk, moving off from the eastern end of the building; we see within whole acres of packing-cases and bales deposited continuously at the exit gates, which disappear with great rapidity, to be succeeded by others.

Our review of the present state of the building commences at the western end, all the doors of which are closed, and all traffic at an end. The two mirrors placed at the end of the nave—said to be the largest in the world—still remain, reflecting the vast empty space before them. Over an expanse of some acres—which was formerly filled with agricultural implements—nothing is now to be seen but an enormous bell, which was used to clear out the workmen during the last two months. The machinery department is the very picture of desolation. It is so completely shut out from the rest of the building that the sounds of active industry going on so near at hand do not penetrate it—no visitor enters it. The ruts and chasms in the flooring still yawn like so many pitfalls, the rain penetrates in many places from the roof, rubbish is strewed about in all directions, and it is at present the most desolate-looking portion of the Crystal Palace. Advancing towards what was facetiously termed the Fine Arts Court, we find the walls of Prince Albert's model cottage still standing; but the inhabitants have fled, and have carried off their household goods, even to the smallest three-legged stool. The colonies have not yet quite disappeared: for Canada remains represented by her own timber in the shape of a vast number of packing-cases all ready for transport; and India, with the usual jealousy which characterizes oriental rule, has her compartments barricaded, and is busy packing up the last remnants of the silks and muslins, and stuffs of gold and embroidery that dazzled the eyes of so many thousands of European visitors. The whole of the flooring in the western half of the nave has been made good, and a number of workmen are busy upon the roof, making it secure, as far as practicable, before the heavy rains set in.

Within the foreign hoarding business is proceeding with great energy and rapidity; the floor is cumbered with piles of full, empty, and broken-up packing-cases and fittings; workmen are hurrying with their low trucks laden with goods to the eastern end, and returning back by another track for a fresh cargo: Custom-house officers are busy attaching their official seals and marks; the din of saws and hammers resounds, and now and then a whole wall of wooden partition comes down with a crash which re-echoes to the very extremities of the building. The objects remaining in the foreign nave are now reduced to a small number. The mountain of zinc on which her Majesty is seated, which we find the Custom House authorities are so much in love with that they will not *visé* its passport, is the most prominent in size, if not in beauty. With the exception of the furniture court, the whole of the French compartments on the south side of the nave are now emptied of their contents. On the north side matters are not so far advanced. The machinery is not yet cleared away, and there are a number of bronze, plaster, and iron castings awaiting their turn. The Aubusson room is denuded of its wondrous tapestries, its exquisite porcelain, and its graceful mar[ble] statues. That of Phryne, which stands at the entrance of the *salon*, which, somehow, unaccountably received a council medal, has recei[ved] from time a delicate veil of cobweb, and plays off a freak of nature aga[inst] the veiled vestal's "trick of art." N[ear] this are thrown together, very inc[on]gruously, statues of the Virgin, of H[ebe], and a satyr, a bust of Napoleon, and a dead lion, and a number of other [ar]ticles, chiefly of raw materials and [che]micals, which have not yet been mo[ved] from their places. Advancing further [among] the foreign States we find Belgium c[om]pletely cleared out, and the only th[ing] remaining is her flag, which still w[aves] beside that of France in friendly riv[alry]. Germany and the States of the Zollverein [are] also "under hatches;" nearly all their [con]tributions being packed up and range[d in] tiers in front of the compartments r[eady] for removal. The States which lay further to the east are all emptied of [their] contents, although they have not all left [the] building, as an immense pace round the [east] door is thickly strewn with hundred[s of] bales and packages of "all nations," and [the] centre of operation, if we may use [the] phrase, has now been evidently remove[d to] this end of the building. Among the art[icles] standing here are two German trave[lling] carriages in full winter costume, so pa[cked] and padded and muffled up that it is diff[icult] to ascertain their identity. The only organ remaining is Willis's, in the western gall[ery].

The contributions are still pouring i[nto] the intended national museum, and, so f[ar as] present appearances enable us to judge, [the] collection will be extremely interesting [and] valuable.

Government School of Mines an[d] Science applied to the Arts.—This v[alua]ble institution has now fairly commence[d its] labours. On the 6th of November [Sir] Henry De la Beche delivered, in the th[eatre] of the institution, the inaugural add[ress], in which he set forth the principles [on] which the system of industrial educatio[n is] to be carried out, and detailed the advan[tages] to Art and manufacture offered by [the] study of applied science. Dr. Lyon Pla[yfair], the professor of chemistry, followed o[n the] same day with an introductory lecture, dir[ected] principally to the advocacy of the advan[tages] to be derived from the cultivation of ab[stract] science in connection with its applica[tion]. The purpose of this lecture was evident[ly to] lead the public mind to the considerati[on of] the question of the application of the su[rplus] funds of the Exhibition in the direction [of an] enlarged scheme of industrial education. [On] the following Monday Professor Ed[ward] Forbes, to whom the chair of natural hi[story] is assigned, delivered his introductory le[cture] on the Advantages of the Study of Na[tural] History. In this lecture he particu[larly] pointed out the advantages to be derived [from] the cultivation of this science in referen[ce to] Art and Art-manufacture. On a future [occa]sion we hope to return to a considerati[on of] this most interesting subject. On Tue[sday] the 11th Professor Robert Hunt, gav[e an] introductory lecture—devoted to the [pur]pose of showing the value of observati[on] connected with the pursuit of physical sc[ience] and the discovery of new facts. These [lec]tures were numerously attended, and [ap]peared to excite much interest. One ple[asing] feature, in connection with this instituti[on, is] the liberal one of having placed a numb[er of] tickets for admission to all the lectures i[n the] hands of Mr. Redgrave for distributio[n by] him amongst the male and female studen[ts of] the School of Design, thus enabling t[hem], free of expense, to cultivate an acquaint[ance] with applied science, at the same time as [they] pursue their studies in the art of design. [We] learn that many of the students are mo[st de]sirous of availing themselves of the opp[ortu]nity, and are already attending the lectu[res].

STATUE OF THE MADONNA.—LOUIS JEHOTTE, BRUSSELS.

SCULPTURE.

THE MADONNA.—BY JEHOTTE, OF BRUSSELS.

This little marble work is treated in a manner somewhat peculiar to the Belgian school, combining great study and laboured effects, but very little of the true inspiration of genius. In accordance with the doctrine of the Roman Catholic Church, Mary is treated as the principal object in the group, the infant Christ holding a subsidiary position. The mother, who is represented as bruising the head of the serpent, being contrary to the orthodox and obvious meaning of the words of the prophecy:—"Her seed shall bruise thy head."

ANCIENT BRITON.—BY ADAMS.

This figure of an Ancient Briton looking out as a scout, done in plaster by Mr. Adams, evinces considerable spirit, and some originality of conception.

THE ELDON GROUP.—BY WATSON.

This portrait group of the late Lords Eldon and Stowell is remarkable for the accuracy of the likenesses, and the calm dignity of the attitudes, though the effect is heavy.

The CRYSTAL PALACE AND ITS CONTENTS.

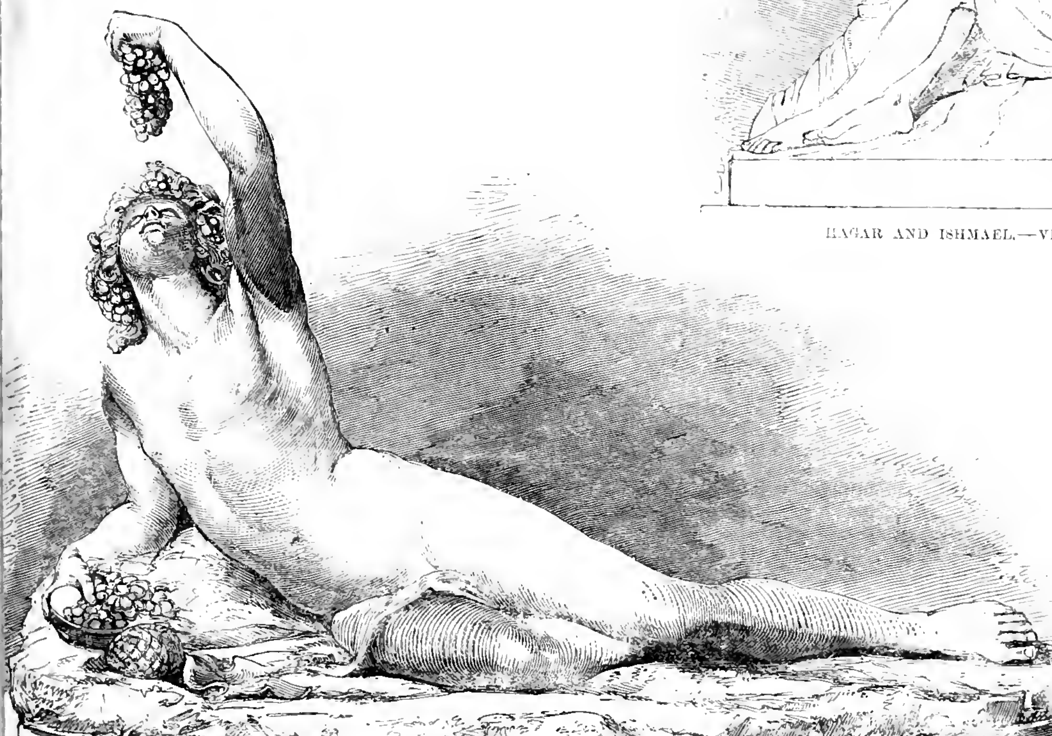
AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

FOREIGN AND COLONIAL DEPARTMENTS

TUSCANY.

ALTHOUGH Tuscany has long since ceased to enjoy the industrial superiority which she held during the Middle Ages, when she reckoned among her tributaries some of what are now the most powerful nations in Europe,—she still looks forward to brighter prospects; and believes that the same sort of pre-eminence which she once derived from her skill in the manufacture of woollen and silk fabrics, may again, in some degree, be realised from the valuable productions of her mines and her soils. It is unquestionable, indeed, that Tuscany, owing to her numerous mines, which are daily being discovered, is the Saxony of Italy; while, for flourishing agriculture, she may be properly compared to Belgium. The grounds for this assertion were to be found upon the tables of this collection, on which were laid out the numerous specimens of minerals, extracted from mines that are now in full work, and from others which, though not worked, are yet well known to contain rich ores. The samples of hard stones, marbles, metallic ores—all so remarkable for their abundance and the great quantity of woods of all descriptions, suited for cabinet-making, and adapted for naval constructions, supplies satisfactory evidence of her natural wealth. The collection of agricultural produce was not so complete as might have been expected; but, boracic acid, of which we were shown superior specimens, is a produce very much sought for, and of Tuscan origin. Discovered in 1777 it was substituted for the borax of India and Thibet which had for a long time supplied the trade. It is now extracted on an extensive scale under the intelligent superintendance of Count de Larderell, in the volcanic localities of Monterotondo and Montecerboli, in the province of Volterra; and nearly all the manufactories in Europe use it. The qualities of the iron from the rich mine of Elba, many samples of which were sent to the general Exhibition are well known. Interesting specimens of iron from that island were to be found in the Tuscan division, as well as

HAGAR AND ISHMAEL.—VILLA, OF FLORENCE.



BACCHUS.—NEURINI, OF FLORENCE.

some of the splendid marbles, granite, cipollino, copper, &c., from the same place. The Tuscan timber is well known to many of the English ship-builders, who are in the habit of using Tuscan in preference to British oak in some departments of ship-building.

Of the specimens of madder-root from the Maremme, the fine samples exhibited were quite equal to the best used in England, and which is imported in large quantities from the Continent. The evidence supplied by the Tuscan manufactories, as to its quality, is satisfactory, especially if we look at the red cotton from the dye-works of an exhibitor of Pisa, who carries on the various processes on a very extensive scale.

Specimens of cotton were exhibited from Ravacchio, near Pisa, where there exists a large manufactory of cotton tissue, which has been the means of improving the whole locality, and of benefiting Tuscany, by substituting for the foreign tissues its own cotton cloth and cashmeres, which might have been seen in the Exhibition, and would have borne comparison with the best tissues of the same quality.

The samples of soaps from Leghorn had been brought to much perfection, and represented a very large manufacturing establishment, exporting annually a considerable proportion of its products.

Among the chemical productions forwarded by Tuscany was *santonina*, a powerful vermifuge.

We cannot pass over in silence another eminently Tuscan manufacture—that of straw bonnets. The specimens sent from Prato and Florence were extremely perfect. The Tuscan kinds of straw-plait were considered very superior.

Tuscany did not forward many statues to the Exhibition: but those which might have been seen—such as Bacchus reclining, Psyche, Hagar and Ishmael, &c.—were sufficient to confirm her celebrity. Those fine statues were selected by a special commission. The selection was not made without consulting several men of such qualifications as to warrant the soundness of their opinion. But the artistical taste of the Tuscans was likewise perceptible in their wood-carvings, in their hard-stone mosaic, and in their scagliola and marquetrie works.

The following interesting particulars of the mineral wealth of Tuscany have been communicated by Professor Corridi, the Tuscan Commissioner:—

Those who noticed the numerous collection of minerals sent from Tuscany to the Great Exhibition, cannot fail to acknowledge how fully that country deserves the reputation it has so long enjoyed for its marbles, and for every other kind of ornamental stones extracted from its quarries. It is certainly richer than any other country in regard to that class of minerals, possessing as it does a very large quantity of statuary and coloured marbles, of granites, chalcedony, real alabaster, and soft stone, or alabastrites, serpentine, &c. Its marble quarries for statuary are very numerous; and those situated in the vicinity of Seravezza and Campiglia, in the Maremme, are the most ancient and the richest of all.

The working of the quarries of Seravezza was completely interrupted towards the end of 1600, solely on account of the decline of the fine arts, although it had yielded a great amount of materials in the times of Michael Angelo and Cosmo I. But the works having been resumed with considerable energy in 1821, through the exertions of the present Grand Duke, Leopold II., and under the excellent management of M. Borrini, they soon reached the highly prosperous condition which they now enjoy. The pure and fine saccharyides, from the mountains of Seravezza, is prized by sculptors, and is in great demand in England, France, Russia, and several other countries. The unquestionable superiority of the produce of these quarries induced the Emperor of Russia to send a considerable order, now in progress of execution, amounting to upwards of one million of roubles, for the internal decoration of the new cathedral of St. Isaac, in St. Petersburg. In the Tuscan department was to be seen a very fine statue, executed in that marble—the "Reclining Bacchus," by Neurini.

Before the year 1821, the period to which we have alluded, the marble trade of Seravezza consisted in the manufacture of a few flooring-flags of common white and blue marbles, from the Capella mountain, and some tables. The improved results during the last twenty five years are almost incredible. There is not a single marble-quarry round Seravezza which is not excavated and furrowed everywhere. Children begin to work when nine years old, and easily earn their livelihood, and adults gain four times as much as they require to keep themselves comfortably. A small market-town has sprung up near the sea shore, where the shipping of marbles takes place, and it contains about 500 people, while, before 1821, the solitary hut of a fisherman was the only edifice discernible on the spot. The natives have by degrees built and manned a small navy, to carry on a coasting trade between Genoa, Leghorn, and Marseilles.

In addition to the white marbles for artistical purposes, the principal centre of which is the mountain of the Altissimo, other magnificent marbles, coloured and veined, from mountains in the neighbourhood of Stazzima, are highly valued by the English and the French. Other important undertakings, of a new description for Tuscany, have recently been attempted—viz., the working of the argentiferous lead mine of Bottino, and the procuring of quicksilver at Ripa, a mountain near Seravezza; the products of which were to be seen at the Great Exhibition, with those of the Altissimo.

As to the marbles from the quarries of Campiglia, under the management of Messrs. Perdicarri and Girardot, of Leghorn, it is to be remarked that the mountain where the works are carried on, and which is known under the name of Monte Rombolo, forms part of a series of mountains consisting of a mass of marble, which, according to the opinion of geologists, is perfectly analogous, as regards its age and origin, with the seat of the celebrated quarries of Carrara and Seravezza. The Monte Rombolo marbles possess various and distinct qualities: some are fit for architectural works, and some are excellent for sculptural purposes. Amongst the latter, artists give the preference to the Pario, which, on account of its white and bright grain, is considered as being equal to the Paros marble of ancient Greece. The common marble, which can be used for sculptural as well as architectural works, is found in large quantities in Monte Rombolo, and yields blocks of the largest dimensions.

There are three other places, in the vicinity of that mountain, where the works are in full operation, namely, the Mortaio, Guire, and Medici quarries. The declivity of the mountain and the proximity of the Campigliese road and the sea afford every facility for conveyance at a very low

ETRUSCAN VASE—ALABASTER.—CHERICI.

price. There is also, near Monte Rombolo, another quarry of blue marble (bardiglio), which proves a very successful undertaking. Tuscany possesses several other remarkable quarries; and, although their works are not in full or regular activity, their richness should induce capitalists to give them a serious attention. Santa Maria del Giudice, in the Pisan mountains, is one of these. The excavation was lately begun; the marble is yellowish sprinkled with large spots, constituting a pudding-stone of exquisite beauty. Several specimens were sent to the Great Exhibition, and, amongst other articles, the frests of a column, the material of which might be used with great advantage for the decoration of buildings.

Other quarries well worthy of notice, are those of Pescaglia, in the Luccan territory. They are situate in the range of the mountains of Hazzema near Seravezza, and lie behind them. They are four in number, at a distance of about half a mile from each other. Artists who have visited them speak highly of their richness. They yield a marble the grain of which has been found excellent, although the superficial structure only has been examined. Three frests of columns and several tables were sent to the Exhibition as specimens of the various marbles of Pescaglia; but, in order to form a correct judgment of those quarries, and of the facilities they afford to work them upon a large scale, it is necessary to see the

blocks of red and black marble that have been lately extracted. They are far superior to the specimens sent, as to their colour, the fineness of their grain, the diminution of specks, and the total absence of small capillary veins.

The Tuscan division presents also specimens of a very valuable marble, which has been but slightly noticed heretofore, and which is known under the name of Lumachella. A specimen of this was exhibited in the shape of a large round table, cut out of a piece of marble from the superficial stratum; it is probable, therefore, that finer blocks might be extracted, should the undertaking be conducted on a larger scale.

The Marquis Panciatichi also sent to the Exhibition two small tables of a very hard stone which is met with in large blocks in the small stream of Manira, which runs down the Vallombrosa mountain, one of the Apennines. These blocks are very scarce, and are harder than porphyry and eastern granites.

The specimens of the fine marbles of Siena on the tables of the Tuscan department confirm their celebrity. They present a great variety. Those known under the names of Giallo di Siena and Eastern Alabaster were amongst the finest in the Exhibition. Castel Nuovo Dell'abate, near Montalcino, in the province of Siena, is in possession of the finest qualities of those marbles as regards their colour, transparency, and hardness, which make them susceptible of receiving the most perfect burnish.

Amongst the plutonic rocks so abundant in Tuscany are the serpentine from Monte-Ferrato, near the town of Prato, and known as Verde di Prato. M. Leonard Nanni presented some fine specimens of that marble from quarries under his management, which now yield blocks sufficiently large to cut statues, vases, or columns, of nearly 1½ cubic metre in dimension. The quality of the marble can be ascertained from a round breakfast service, ¾ metre in diameter. The quarries are in full operation, and any quantity of marble can be obtained from them.

In addition to these there were ornamental stones from the island of Elba, which supplies granite, cipollino, black marble with white veins, &c. Granite constitutes a portion of the soil of that island, and very remarkable blocks have been procured thence at different periods. A quantity of large columns, and chiefly those in the cathedral and baptistry of Florence, were cut out of blocks from the mountains of Elba—principally those of Santo Pietro in Campo. The Grand Duke Cosmo I. caused a piece of granite from that island to be shaped into a large bowl, about 20 metres in circumference, which was placed in the garden of the Pitti Palace in Florence, where it can still be seen. The gallery in the cathedral of Ravenna consists of a single block of that granite, and it was the largest in existence until the erection of the granite pedestal to support the statue of Peter the Great in St. Petersburg.

HAGAR AND ISHMAEL.—VILLA.

In his small marble group of "Hagar and Ishmael," Signor Villa, of Florence, seizes a different moment from that selected in the same story by Max, of Prague, noticed in a previous article on Sculpture. In the latter the mother beholds the sufferings of her child, and appeals to Heaven for relief; an incident, the proper expression of which was admirably realised. In the work now before us Hagar is applying the bowl of water to the parched lips of her son. There is not the same amount of poetic interest patent in the one case as in the other; but what the subject afforded, Signor Villa has done justice to in this very pleasing and carefully executed composition.

BACCHUS RECLINING.—NEURINI.

This very spirited statue stood in one of the front bays of the Tuscan department. It is in white marble, by Professor Neurini of Florence, and as the date upon it "1850" implies, was probably executed expressly for the Great Exhibition. The god of wine, who has none of the bloated appearance attributed to him by modern conventionalism, is reclining in an easy graceful attitude, whilst he squeezes the juice from a bunch of newly plucked grapes into his mouth. The treatment and execution are of a high order of merit.

ALABASTER VASE.

This is remarkable as a very fine specimen of workmanship in alabaster. The vase is Etruscan in form, and is embellished with reliefs—the subject, Phœbus and Aurora. Including the pedestal, it stood 7 feet high.

POTTERY, PORCELAIN, TILES, &c.

STATUARY PORCELAIN.

At the period when the manufacture of porcelain at Chelsea was in all its activity, the works at that place supplied chimney ornaments to the country generally. Many of the old Chelsea porcelain figures were very finely executed, but by far the larger number were grotesque imitations of humanity, some of which are still to be discovered in the china closets of our grandmothers. Dresden was also celebrated for producing figures, and these were, not unfrequently, of a high character as works of art, but still they were all composed of the ordinary porcelain. Wedgwood, of Etruria, introduced a stone-ware—a true vitrified body of a highly silicious character—which he was enabled to produce either black or coloured. In this material, that extraordinary man has perpetuated the works of Flaxman, and given permanence to many of the most choice relics which time has spared us of the vases of antiquity. If we examine the pottery of Stafford-shire before the time of Wedgwood we find it—with the slight exception of the red earthenware of the Elers of Nuremberg, who settled at Bradwell—to be of imperfect material and rude in form. Wedgwood saw that the work of the potter was capable of great elevation in its character; he directed his powerful mind to the study of the chemistry of clay, and of the physical characters of earths, and the result was the production of numerous kinds of ware, all of them excellent in their varieties. He advanced a step beyond this—he sought out the beautiful where it already existed in examples of the potter's art, and copied it with surprising accuracy. His fac-simile of the Portland Vase may be quoted as an example.

The genius of Flaxman was also enlisted in aid of the enlightened potter. High art was, for the first time in this country, associated with manufacture, and the result was—what it must always prove to be—eminently successful. With the death of Wedgwood, the process of improvement ceased, and, since there is no standing still, the pottery deteriorated rapidly in every way, and continued at a low point until within the past few years. The energies of a few houses in the trade have awakened general attention to the improvement of clay manufacture, and we may regard the present as the commencement of a new era in porcelain wares. Statuary porcelain and Parian were exhibited by several houses, and as this manufacture is a recent introduction, and one which promises to be of high utility in many ways, a brief history of it may not be out of place.

The first idea of imitating marble in ceramic manufacture appears to have originated, in 1842, with Mr. Thomas Battam, the artist directing the large porcelain manufactory of Mr. Alderman Copeland, and was prominently brought under public notice by the Art-Union of London, which gave as one of its prizes a copy of Gibson's Narcissus, formed of this material. The principal ingredients in this composition are kaolin, feldspar, and silica, ground and mixed together in the ordinary method adopted in the general processes of this manufacture. It is prepared for the use of the figure-makers in a state technically called "slip," about the consistency of thick cream. In this state it is poured into the different moulds forming the sub-divisions of the figure or group, which, being made of gypsum (plaster of Paris), rapidly absorb a portion of the moisture, and reduce the coating immediately next the mould to a semi-clay state, of a sufficient thickness for the "cast," when the superfluous "slip" is then poured back from the moulds. This cast remains in the mould for some time at a high temperature, which, by causing still further evaporation, gradually reduces the "slip" to a state of "clay" sufficiently firm to support its own weight when relieved from the moulds, and to bear the necessary pressure of the handling without injury. The various parts (and in some groups there are as many as fifty) are then delivered from the moulds. They have then to be repaired, the seams caused by the junction of the moulds to be cleared off, and the whole put together.

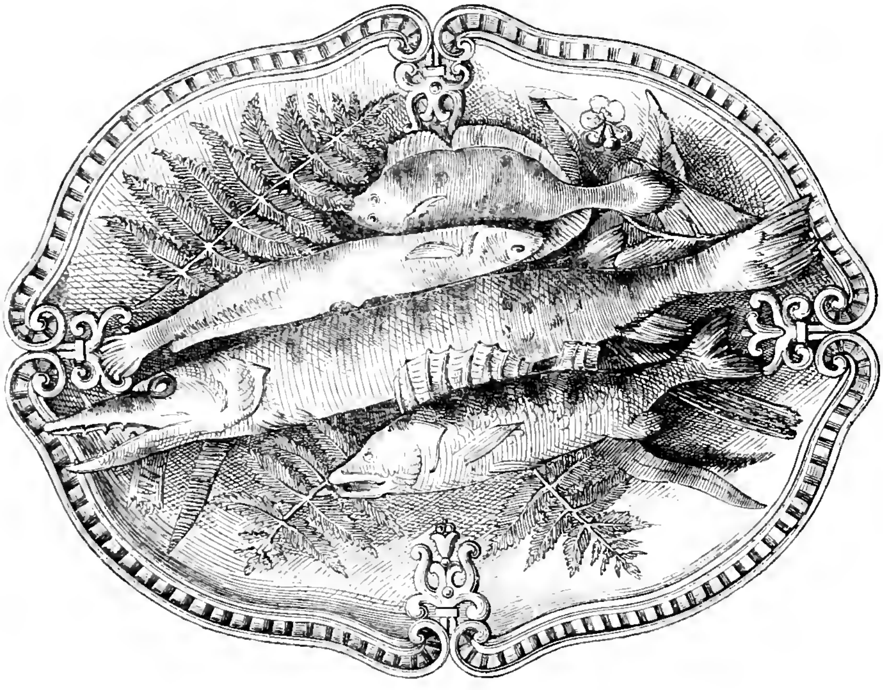
This process requires much nicety and judgment in the manipulator to perform it successfully; the clay in this state being so exceedingly fragile, that considerable practical knowledge is necessary to effect a perfect union of the different members without injury to their form and surface, and to dispose them in strict accordance with their relative positions in the original model. Casts from the same figure, and made from the same moulds, will not necessarily possess the same merit. In this respect much will depend upon the skill and judgment of the "figure-maker." Nude figures, in which the junction of the difficult parts generally presents a level circular surface, require peculiar care in fitting together. Surfaces that present a marked and broken outline, and which will but fit together at one particular point, are of course relieved from this difficulty. It will be immediately evident that, to execute this branch of manufacture with the perfection of which it is capable, a very high degree of artistic knowledge and feeling must be brought to bear upon it. Unfortunately, as yet, this is not the case, the operatives employed not possessing these advantages. The parts are attached together with some of the "slip" as originally used for the casting, the surfaces to be joined together, being either dipped in it, or a coating of it applied with a pencil; this causes perfect adhesion, with a very slight pressure. Much depends upon the skill with which these junctions are executed, and on the neatness with which the sections of the moulds are made to fit, as, upon due attention to these particulars, the greater or less degree of prominence in the "seams," which so often disfigure pottery castings, entirely rests. With great care and tact, it is possible to render these "seams" so trifling, as, even upon a close examination, to be scarcely perceptible.

The "slip," in this case, is merely required to soften the surface of the clay on those parts which have to be united, just sufficiently to cause adhesion: and all that is used beyond what answers that requirement is not only superfluous, but detrimental, by moistening the edges of the parts to which it is applied so much, that they become pliant, and, yielding to the pressure while being attached, distort the outline; and also, by causing unequal shrinking during the process of "firing," the junctures become evident and unsightly.

The figure, or group, thus made, remains two or three days, during which time it becomes sufficiently dry for the oven. It is supported by props, made of the same material, so arranged as to bear a portion of the weight, and to prevent any undue pressure which might cause the figure to sink in the firing.

It is then placed in the oven on a "sagger," the usual case to protect the ware from the flames, and submitted to a heat of 60 deg. of Wedgwood's pyrometer.

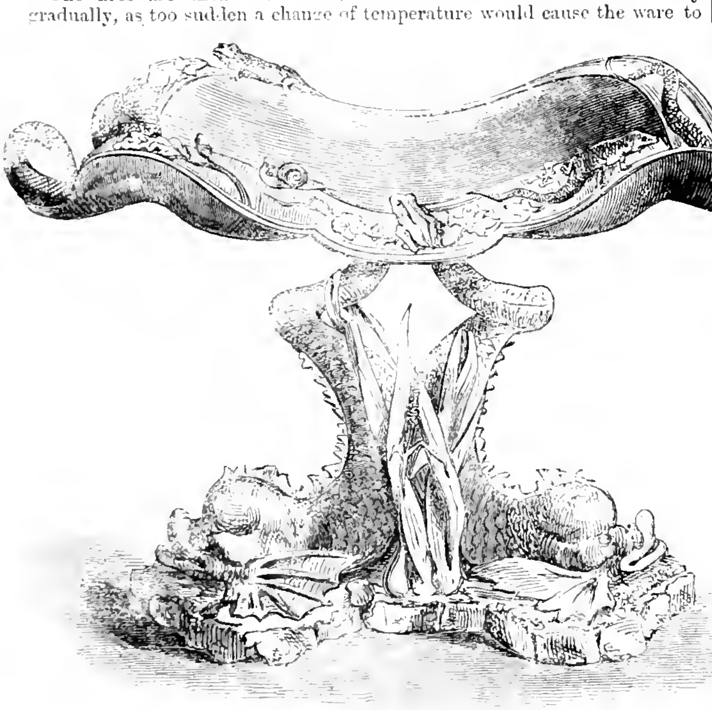
This operation, which occupies from sixty to seventy hours, is effected very gradually. Small pieces of ware, termed "trials," expressly made for



POTTERY.—AVISSEAU.

the purpose, are occasionally drawn from the oven to ascertain the progress and degree of heat.

The fires are then withdrawn, and the oven allowed to cool very gradually, as too sudden a change of temperature would cause the ware to



POTTERY.—AVISSEAU.

crack. When sufficiently cool, the figures are drawn out, and the seams, which, although perfectly cleared off in the clay state, will again partially rise during the process of firing, are then rubbed down, and the figures again submitted to a still higher degree of heat than in the first firing. The figures are placed on a bed of sand in the latter firing, instead of being "propped," as in the former, as this bed more equally supports the figure; and the clay having been once fired, the surface is not injured by being in contact with the sand. It could not be used when the figures are in the clay state, as it would resist the contraction of the material, and cause the figure to be shattered to pieces. It is often necessary to fire the casts three times—a peculiar degree of heat being required to produce the extreme beauty of surface which the finest specimens present.

The total "contraction" of the figures from the mould to the finished state is one-fourth. The contraction of the "slip" with which the mould is charged to the clay state in which it leaves the mould is one-sixteenth. Again, it contracts another sixteenth in the process of drying for the oven, and one-eighth in the process of vitrification; so that a model of two feet high will but produce a fired cast of eighteen inches.

Now, as, to ensure a perfect work, it is necessary that this "contraction" should equally affect the whole of the subject through all its relative bearings and proportions, it will be immediately apparent that there is considerable hazard in its execution, so as to realise such a result as shall satisfy the requirements of a highly educated taste.

Still, difficult as it unquestionably is, with a judicious selection of subject, and practical knowledge as to its treatment, a faithful realisation of the finest beauties of the works of art may be effected. We need only point, in proof of this, to the groups of Ino and Bacchus, of Foley; Prodigal's Return, of Theed; Rebekah, of Theed; Gibson's Narcissus; Foley's Innocence; Marshall's Dancing Girl; Indian and Negress, by Cumberworth, &c. The value of this invention, it must be borne in mind, is not limited to its immediate influence upon the branch of manufactures to which it is directly applied; it has already been largely instrumental by its success in inducing a perception of the commercial value attending the more intimate connexion between art and manufacture. It is almost impossible to elevate one branch of a manufacture in artistic value without, at the same time, in some degree, raising the general productions of the whole class. The connexion of such names as Gibson, Foley, Marshall, Marochetti, Theed, &c., with this class of works, will necessarily exercise a marked influence upon all ceramic manufactures. The improvement in the figure models will be followed by a similar improvement in the ornamental models, and will also extend to a more elevated class of decorative labour. Indeed, it is difficult to over-estimate the salutary influence which this branch of art will gradually extend over the whole field of Art-labour.

The adaptation of articles of this class for ornamental purposes in connexion with metal, as evidenced in the works of Messrs. Potts and Winfield, of Birmingham, is also highly gratifying; and although the specimens may not be altogether such as might be wished, they are sufficient to prove that the article may be usefully employed for this purpose.

It was first applied to metal mountings, in various methods and for various purposes, by Mr. W. Potts, of Easy row, Birmingham, who received the prize at the Society of Arts for the adaptation.

According to the classification adopted in the Exhibition this material is divided into statuary porcelain, Parian, and Carrara. This may be a refinement, but it is a perfectly unnecessary one, the materials only differing in the proportions of the ingredients employed by the manufacturer. The composition, according to analysis of the material employed by Messrs. Copeland and Co., is silica, 60·35; alumina, 32; soda, 4·16; potash, 2·55; with traces of lime, magnesia, and iron. The material is used in a liquid state, technically called "slip," about the consistency of thick cream. It is poured into moulds forming the figure or group, which, being made of plaster, rapidly absorb a portion of the moisture, and the coating immediately next the mould soon becomes of sufficient thickness for the cast, when the superfluous "slip" is poured back. The cast remains in the mould for some time, at a high temperature, by which means it is, through the evaporation which takes place, reduced to a state of clay, sufficiently firm to bear its own weight when relieved from the moulds, which are then opened, and the different portions of the subject taken out. Each figure requires many moulds; the head, arms and hands, legs, body, parts of the drapery (when introduced), and the other details of the subject are generally moulded separately. The parts, being removed from the moulds, have to be repaired; the seams caused by the junction of the moulds must be cleaned off, and the whole put together. This is, of course, a delicate process, requiring much artistic skill; for, though all the parts may be from the same mould, it by no means follows that all the casts will be of equal merit, so

much depending upon the taste and skill of the finisher the figure-maker.

Numerous examples of this manufacture, of very great beauty, were to be found in class 25. Messrs. Minton and Co. exhibited statuettes and busts from designs by Dancker, Cellini, Thorwaldsen, Westmacott, Townsend, and Bell. In the Victoria Desert Service, which has been purchased by Her Majesty for a thousand guineas, and is intended as a present to the Emperor of Austria, we have the combination of Parian and fine porcelain, effected with very great skill and considerable taste. The service is a full one, consisting of 72 dessert plates, 20 compotiers, and 24 other articles; it is white, turquoise, and gold. In the wine-cooler, we have the union of high art with manufacture very finely exemplified. Round the outside it has, in bas-relief, a bear hunt represented, and hunters with their dogs form a series of statuette groups round the pedestal. A streak of gold runs in and out through the design, and the whole has a very pleasing effect, the Parian contrasting admirably with the glazed porcelain. The whole is crowned with an infant Bacchus pressing grapes. We are informed by member of the firm that the expense of designing, modelling, and decorating this service far exceeded that of any service ever before manufactured in this country; yet, with all its elaboration, it was completed within twelve months.

Another article worthy of notice is the Parnassus vase, which, like the Victoria dessert service, is a combination of Parian and porcelain. It is an original design of one of Messrs. Minton and Co.'s modellers, and has many points of interest. The china is in mazarine, richly gilt—the Parian basrelief represents Apollo and the Muses. The modellings of the festoons on this vase are considered, by competent judges, equal to Sèvres.

In addition to these we may enumerate, as objects of especial interest, the following :—

The Cellini ewer and stand, in Parian gilt—an original design by another of Messrs. Minton and Co.'s modellers, and admirable in form and execution.

The equestrian statues—"Amazon" (after Feuchère) and "Theseus"—the latter original.

"Temperance" and "Flora"—copies from terra-cotta statues in the collection of the Duke of Sutherland.

"Dorothea," "Clorinda," "Miranda," "Una and the Lion," "The Babes in the Wood," and some others—the works of Mr. John Bell, sculptor.

"The Distressed Mother," after Sir R. Westmacott's statue in Westminster Abbey.

"Love restraining Wrath"—an original group by Mr. Beattie, a clever artist, now resident in the Potteries.

"Atala and Chactas," also original, and suggested by a passage in Chateaubriand's celebrated tale.

The two groups of "Boys with Goats" are beautifully modelled; they are original productions, in the style of the last century. We have also the "Greek Slave" of Mr. Powers, the original of which was at the eastern end of the main avenue. Numerous other examples of Parian will be found in this collection of Messrs. Minton and Co. On another occasion we shall return to a consideration of the other works from this house—particularly their imitations of the majolica ware, and their encaustic tiles and tesseræ.

Messrs. Wedgwood and Sons, of Etruria, the descendants of the great improver of ceramic art in this country, are exhibitors of the Carrara porcelain statuary, much of which is very beautiful.

Messrs. Mayers, of Dale Hall Pottery; Meigh and Sons, of Hanley; T. and S. Boote, of Burslem; Bell and Co., of Glasgow; J. Rose and Co., of Coalbrookdale; and T. Hughes, jun., of Colbridge, are also exhibitors of this Parian ware.

In the foreign department were some statuettes and busts in a similar material. Some examples from the porcelain manufactories of Copenhagen, being copies of the most favourite works of Thorwaldsen, were well worthy of attention. The introduction of this branch of manufacture has so far improved the business of the porcelain manufactory at Copenhagen, that the value of the articles sold has increased from a few hundred dollars to many thousand pounds annually.

Whenever the public are supplied with works of merit, they avail themselves most readily of the privilege of possessing them, if they are at all within the limits of their means. Of the salutary results of the popular cultivation of art, in a moral and a social point of view, there can be no doubt; and on this ground, among others, we desire to see the fine examples in statuary porcelain which are exhibited, largely multiplied, and, by the increased demand which must be created, brought within the limits of the humbler classes.

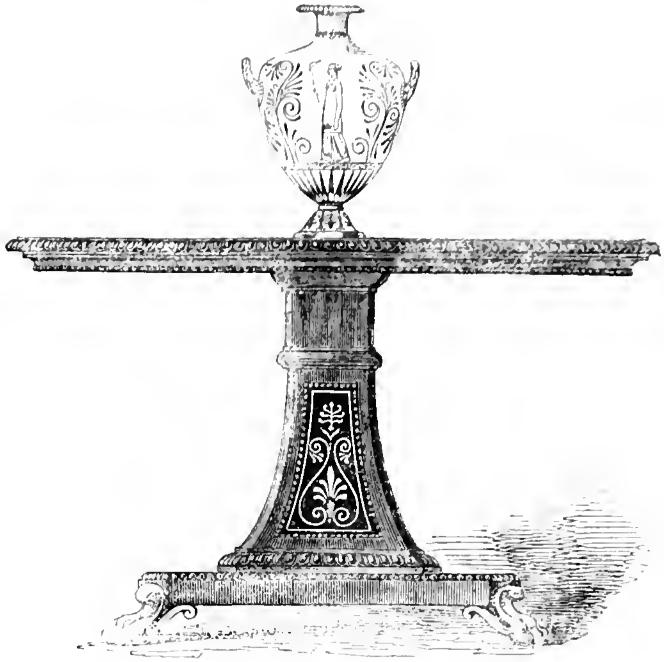
POTTERY.—BY M. AVISSEAU.

THE cup and dish of coarse pottery exhibited by Mons. Avisseau, are admirable imitations of the ware made by Bernard Palissy, in the sixteenth century. The fish, dolphins, frogs, plants, &c., which ornament these and other specimens displayed by M. Avisseau, are modelled with great spirit, and coloured with much taste; in fact, these examples are very close imitations of Palissy's renowned ware.

FURNITURE, DECORATION, &c.

CABINET WORK.

THE experience of the Great Exhibition has been to afford many lessons for the willing student, to inflict many wounds on the pedantic and self satisfied genius, to remove many prejudices and conceits, and to teach many moral truths to all; and though it works silently, it yet works effectually, and will eventually accomplish these results. It must be



EBONY TABLE, INLAID WITH SILVER.—HANCOCK.

looked upon as being to the world what the metropolis is to the provinces—the place where pretension is tested, where the self-inflated shrink to their own natural littleness, and where the fancied giant not unfrequently

becomes a dwarf. In the Exhibition the nations of the earth were on their trial; they boldly came up to the muster: each, with the practical evidence of its ability to administer to the necessities, comforts, or luxuries of humanity, having agreed to subject itself to the ordeal of comparison—the severest of tests when a high standard of excellence is selected.

In offering our observations on the articles exhibited in the important class of Furniture and Decorations, we may first state that it was here that

our British manufacturers expected, probably, more than in any other, to be discounted; and we venture to say that there are few of the British exhibitors who have contributed their portion to what is, after all, a most excellent display, who had not some considerable misgiving as to the general character of the works that would be produced on the occasion. Without flattery, we think we may assert that their apprehensions have proved groundless, and that England has come off with flying colours, even on this field of contest.

We are glad of it: for we think a little reflection will show that the subject of furniture is more important in England than on the continent; because much more money is spent here, by the middle classes of all incomes, on the various branches of trade required to fit up a house, than is ever thought necessary in other realms. Whether upon marriage, upon taking another dwelling, or upon a plea of necessity, ladies are always ready to receive furniture from the factory to displace that which must certainly have one of two faults: either it is not fit to be seen, or it is not old enough to be valuable for its antiquity. The accumulation of this sort of property is surprising, for apartments are hardly considered to be well dressed until there is literally little chance of human motion, and no possibility of adding to the treasures. With the last century, too, expired the empire of fashions which, during the lifetime of the sovereign whom they found upon the throne, reigned steadily over the whole of the community, in solitary grandeur, without disturbance from any interloping modes; at present, the rapid succession of tastes, and of late years their contemporaneous existence, having allowed purchasers to render their saloons little more than museums for every phase of ornamental art, it becomes easy, by small additions, to incline the balance in accordance with a prevalent mania; but these additions are, for the same reason, constantly demanded.

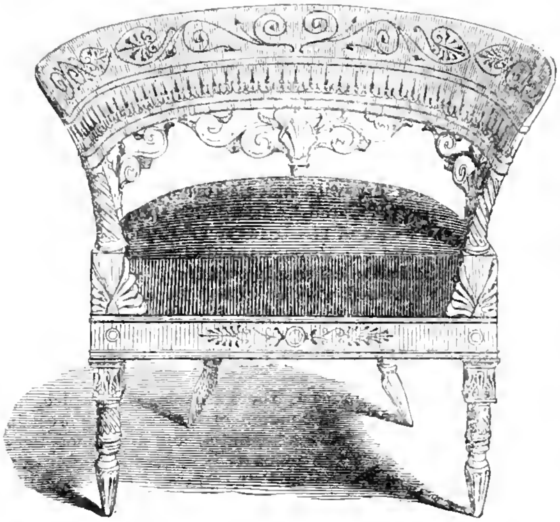
The order in which various leading styles of decoration have re-appeared is tolerably uniform. Since the time of Louis XVI. we have had Roman, Louis XV., and Greek; then Gothic, Louis XIV., and Egyptian have followed as links of a chain terminating in Louis XV., Elizabethan, Louis XVI., Italian, Gothic, Louis XIV., and *Rénaissance*. Thus, in the species of Greek, or *par excellence* classic furniture, but two specimens of high merit have come under observation; one is the ebony table inlaid with silver, by Hancock; the other is the chair by Jeanselmé; both are carefully moulded upon antique ideas, and deserve consideration for their inherent unobtrusive elegance. They recal the "Hope" fashion, as it was set by the predecessor of the present distinguished amateur; and are interesting to those who have not frequent opportunities of seeing the as yet undisturbed interior of some of the large houses which were furnished forty-five years ago.

We appear at this time to have just entered upon the last mode of the cycle, and of its merits the reader will be reminded by the illustration of one of the largest works of this class in the Exposition, the side of a library, by Holland and Son. In spite of the unpleasant colour (which will disappear) of the newly-worked wood, and of the perforated panels, there are about this, as also about nearly all other English specimens of furniture exhibited, three qualities which distinguish them in a very remarkable manner from nearly all their foreign companions. These three virtues—for such they fortunately happen to be, consist in fidelity of adherence to the style employed, in a peculiar feeling of design, and in undeniable superiority of execution.

No class enjoys so many opportunities of seeing the most *recherché* work as the Russian nobleman, when he is allowed to travel; and such a connoisseur, talking to an English acquaintance, was triumphantly proving what our countrymen could not see, that the Transept divided two, and only two states of feeling for decoration—the western one considerably mixed with elements foreign to it, but the eastern portion nearly free from any alloy of Anglicism; and he afterwards urged that there was no truly national taste in Russia and Germany, as Parisian fashions for every sort of ornament were always eagerly watched. Ten years of observation had not led to a false conclusion, and the reader is recommended to seek himself the outward marks of the difference. He will have noticed on one side great elegance of proportion, vivacity of light and shade, and wonderful fluency of design, mixing with a malicious, almost a wicked, carelessness as to whether a piece of furniture shall belong to any given style at all, or belong equally to three or four, opposed to sterner dignity, extreme breadth of light, and a remarkable air of usability, united, on the other hand, to a sometimes pedantic adherence to the peculiar features of the fashion which is followed. To sum up this train of thought, it will suffice to add, that a beauty in the one case and grandeur in its antagonist are attained; it must be left to the idiosyncracies of the spectator to decide which is preferable for himself.

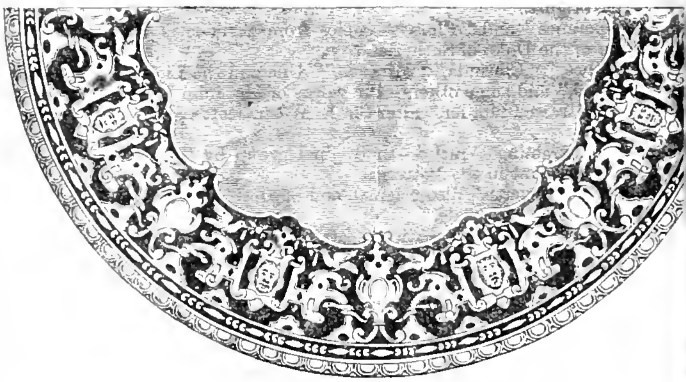
English furniture possesses a character of genuineness, a solidity, and an admirable workmanship, which are unrivalled in any other part of the world. One very important advantage we possess over our foreign rivals is in the variety and superior quality of our woods.

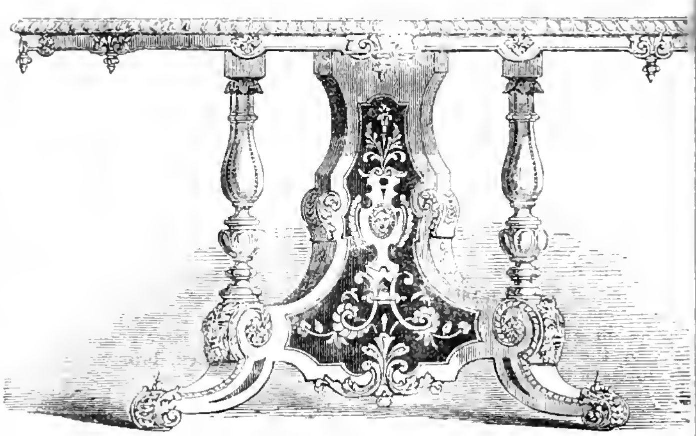
"One important fact," says M. Flachat, speaking of the cabinet work of France, "must be noticed—the great inferiority of our indigenous woods. We see this in many objects of furniture, while mahogany and other tropical woods, which are more largely used this year than we ever before observed, clearly proves the fact. If we except the walnut-tree, with its beautiful grains, our wood is deficient in that vivacity of colours, that variety of texture, that fulness of fibre, which the woods of a hot climate present; and time, instead of improving its condition, only gives it a dull, cold, grey, and leaden appearance. Moreover, exotic woods improve by keeping; ours, on the contrary, lose their beauty. Here, then, we have a branch of industry in which the foreigner is decidedly superior to us—in



CHAIR.—JEANSELME.

the command of the raw material; and, being compelled by the inferiority of our own produce to import three millions of kilograms of exotic wood to supply our industry, the question naturally arises, can we do so upon the same terms as the foreigner? A comparison, therefore, may be made





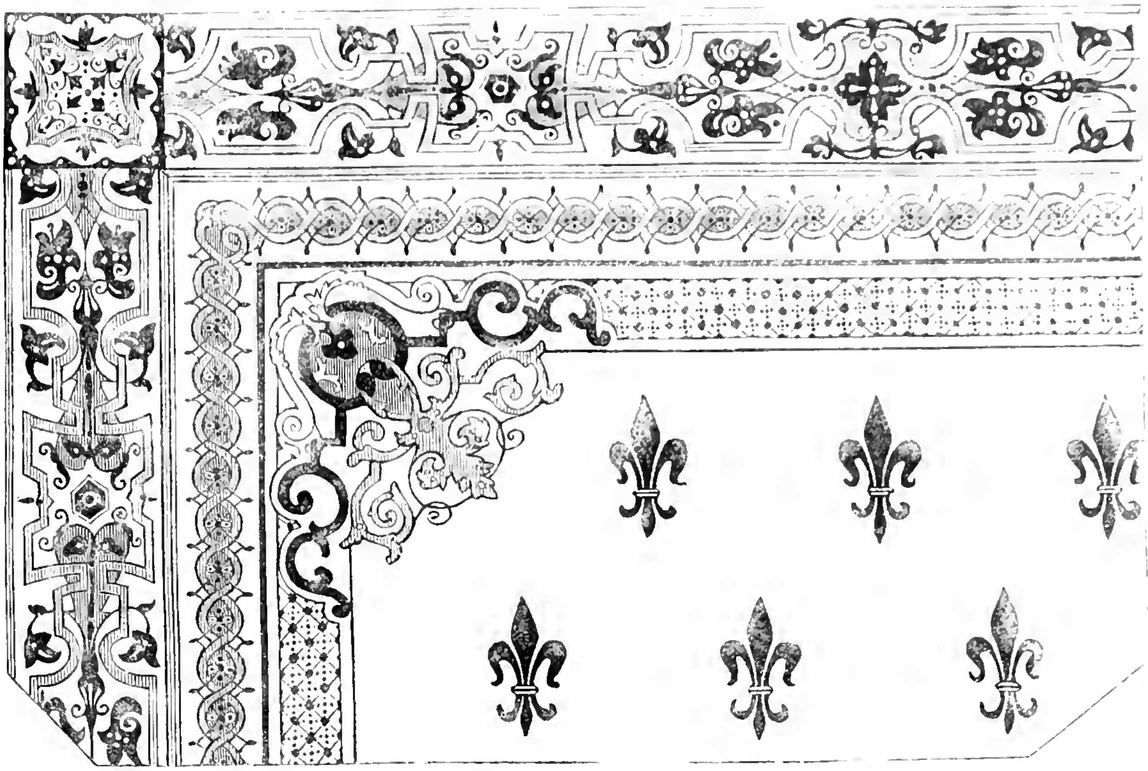
MARQUETRIE TABLE—BAUTRY AND SONS.

between the relative extent and importance of the English and French cabinet work, by estimating the respective imports of mahogany into the two countries. In a single commercial establishment—the West India Docks—we have seen fifteen thousand logs of mahogany at the same time, which is about double the importation of France in a single year. These logs generally are much larger in dimension than those which are transported to Paris by the navigation of the Seine, some of them measuring even 2m. 50c. in diameter. In England, moreover, they have powerful

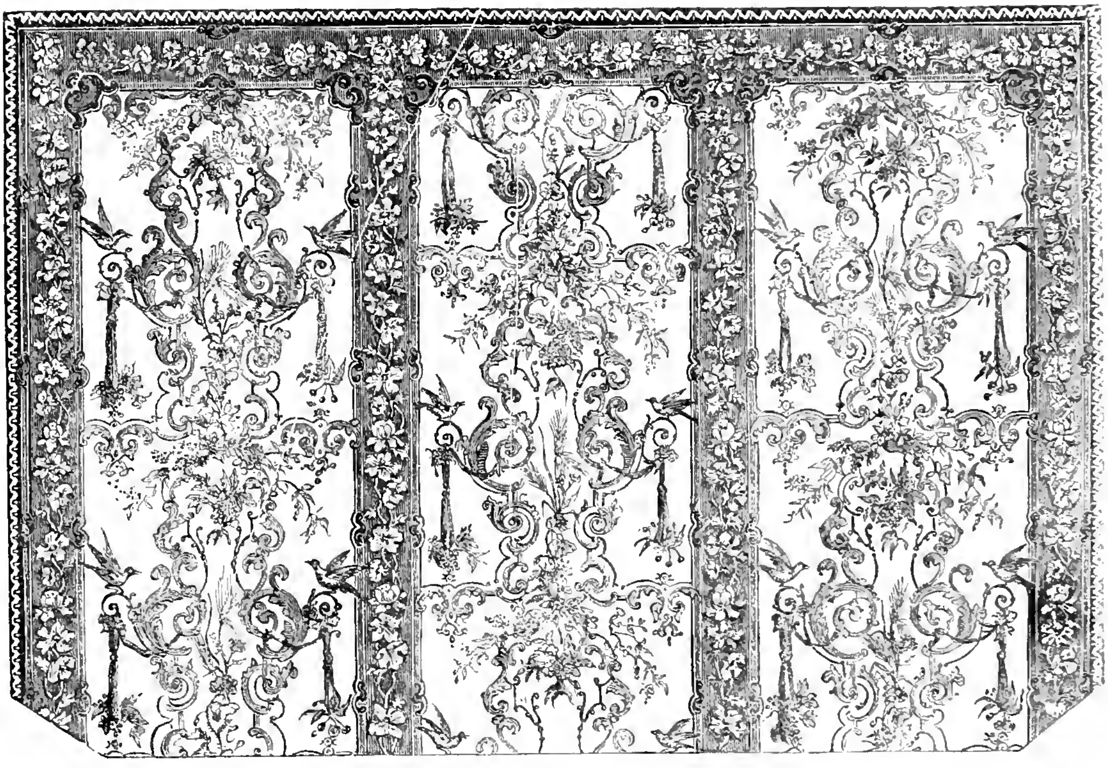
machinery for disembarking the mahogany, and placing it under shelter, by this means they obtain two advantages of which we are deficient first, the wood is not exposed to the atmosphere for a long period, which materially deteriorates its surface, and produces a loss; and secondly, there is a great economy in the conveyance, which is a considerable per centage upon the consumption."

Another distinctive feature between the two countries is this, that in England the best workmen are found in large manufactories, at the head of which is a man of capital, who pays good wages according to ability; whereas in France the number of workmen, each labouring at home for himself, and after his own fashion, is immense: this, indeed, is the rule in Paris; whereas, with us, it is the exception. "The larger portion of these petty makers, " Mr. Flachat observes, "are ill-provided with tools, and purchase their materials in detail, or, in other terms, pay dearly for everything they use. They make a piece of furniture, then run with it to a cheap dealer, who generally beats down the price, and gets it at his own valuation. It is quite common to see these workmen trotting about the Faubourg St. Antoine, and elsewhere, with their weekly work, first to one shop, then to another, in order to dispose of it to the best advantage; and if they fail in meeting with a purchaser, there is no alternative but the Mont-de-Piété. What progress, therefore, can our working-men make under such a system?" We now proceed to notice a few of the most striking objects of furniture, British and Foreign, in the Great Exhibition. Our present glance, however, does not comprise a tithe of the articles we shall have to notice in detail.

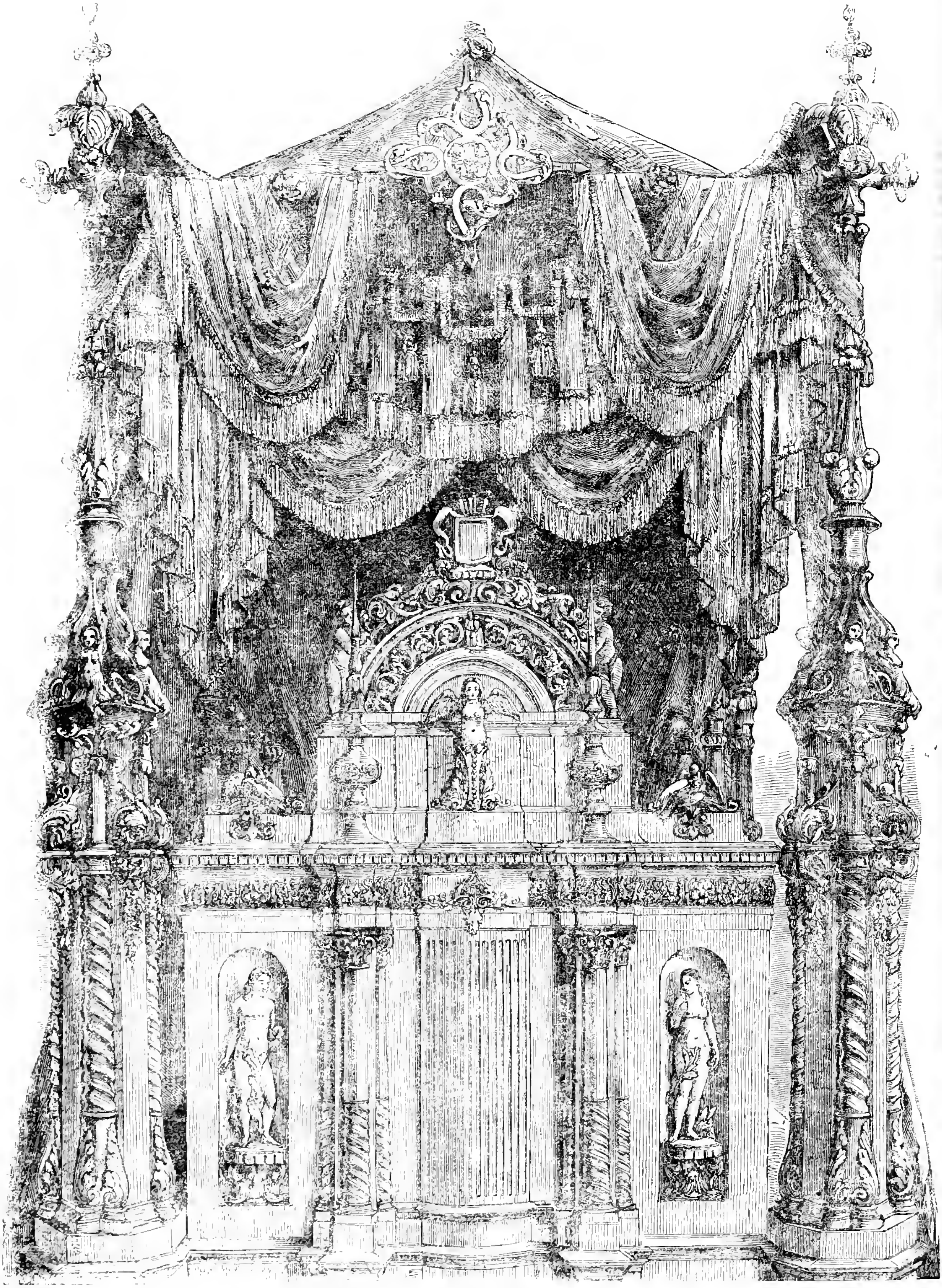
In the Eastern Nave, the bed, by Leistler, of Vienna, is not only one of the most sumptuous productions, but is also grander than any of its English fellows; it is, indeed, a state bed, being eleven feet long by nine feet wide, and thirteen feet high, made of zebra wood. It is an excellent example of the general criticism above enunciated: every portion is an isolated beauty; all are grouped with admirable skill to obtain relief by shadow, and (what no Briton would have been bold [illegible] it) the supports of the head are [illegible] those of the foot. The head is occupied by a beautiful Angel of Peace in an arched niche, placed between panelled-work, and at the foot are representations of our first parents. The *putti* are really "little loves," and the ornaments are very effective. Here praise ends. While the foliage is Gothic, and the figures, with the decoration, Italian, the mass of the work is of modern *Rénaissance* feeling; neither do the wood and the work agree



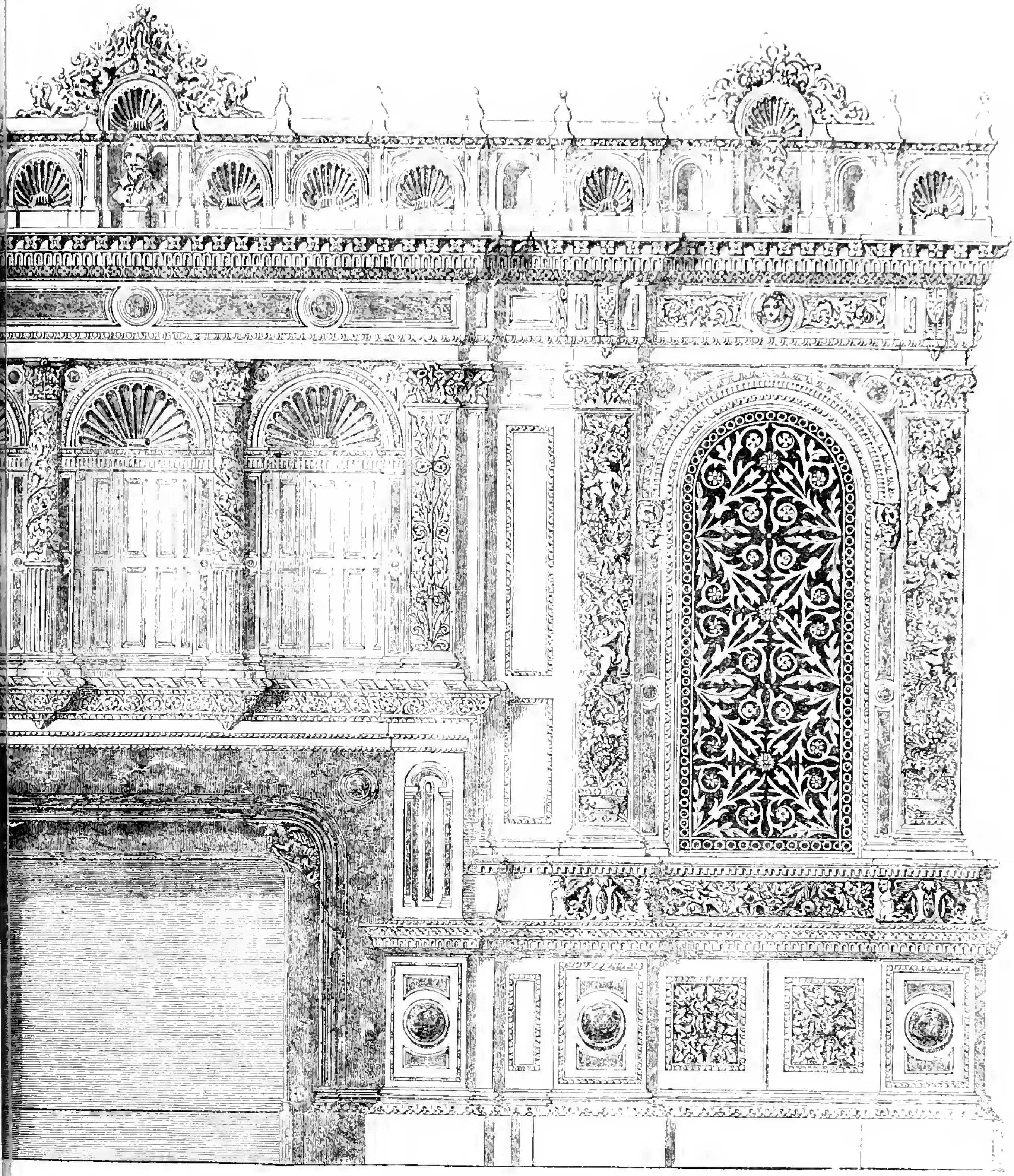
PAPER PATTERNS.—MESSRS. TURNER AND CO.



PAPER PATTERNS.—SCOTT, CUTHBERTSON AND CO.



STATE BEDSTEAD. LEISTLER, OF VIENNA.



ROOM DECORATION.—HOLLAND AND SON.

nd the execution seems hurried. The canopy (in which horrible are lurking) is a vast cavern's roof, a fault which this shares in n with some of the English beds. One cabinet maker, after looking nutely, said, "They have better tools than I thought."

ly opposed in spirit is the Amboyna inlaid table, by Caldecott, in an than taste, and not a little marked with the dignity of simplicity is attributed to the best efforts of London houses; the pretty arabesque border and centre have been enlarged on the same Engraving, and will serve to direct attention to the reality, which professes, as many other inlays profess, to be of unstained, *i. e.* self-coloured woods. This must be considered when similar works hereafter come into these pages.

A very little consideration will show that the beautiful little walnut-wood frames and other carved furniture from Tuscany (see page 118) are not very far removed from those produced in the East Indies, in so far as the fashion

(Roman) of the time of our Charleses is concerned. The *Dalbergia latifolia*, or blackwood, somewhat resembling veined ebony, and new to cabinet-makers, has been worked at Bombay and Madras, from designs by the London carver, Rogers, into a table, flower-stands, tea-caddies, a candelabrum, and cheffoniers. Though this has been the means of obtaining variety, we cannot say that upon the whole they are improvements upon the strictly native productions. The workmen have evidently copied the patterns with great exactness, but there is wanting that freedom which is attained in repetitions of familiar and in conventionalised devices. The devices themselves, also, are sometimes heavy.

PAPER-STAINING, HANGINGS, ETC.

The following general account of the arts of paper-staining and hanging, is abridged, with slight alteration, from Grant's interesting little volume, "The World in its Workshops":—

The art of paper-staining and paper-hanging has now become one of the most interesting and useful branches of industry, whether viewed in relation to the amount of skilled labour and capital employed, or the elegance, refinement, and convenience which it supplies to our social wants. Paper-hangings are of comparatively modern date, being originally manufactured as a cheap imitation of the rich stuffs and tapestries used by the wealthy and great in the coverings of the walls and wainscotings of their apartments. The French, we believe, were the first to bring them into general use.

Paper-hangings may be divided, for convenience sake, into three branches—the flock, the metal, and the coloured. Each of these appears to have been invented at different times, in imitation of a material then much in vogue, as, for instance, the flock to imitate the tapestries, the coloured to imitate the gilt leather which the Spaniards brought into general use, and, lastly, the metal, which was intended as an economical substitute for painted decorations. Beckman, in his History of Inventions states that flock paper was first manufactured in England by one Jerome Lanyer, in the reign of Charles I.; the "Dictionary of Commerce, of 1723, under the head of *dominoteric*, or marble paper, such as is used by the old bookbinders, gives a minute description of the mode of printing the latter, and cites statutes to regulate the industry, dated 1586, in which rules are given as to what kind of presses are to be used by the *dominotiers*, and prohibiting them, under heavy penalties, from printing with types. Here we catch a glimpse of the keen-eyed vigilance of the Romish church, which dreaded the progress of the Reformation, then spreading fast and far into every region of human thought. From the preceding relation, it is fair to infer that block-printing was first practised in France.

It is evident that the art of paper-staining and paper-hanging was carried on in this country to a considerable extent, from the time of Charles I. down to Queen Anne; and its subsequent history may be traced, with comparative accuracy, by the decorations adopted by the nobility and gentry, several of which are still preserved, either on the walls of their apartments, or in the works devoted to the illustration of their mansions. In the year 1712, the tenth of Anne, a duty of $1\frac{3}{4}$d. per square yard was imposed on the manufacture of stained-paper; and some of the flock-paper, one hundred years old, resembles, in every respect, the modern material. The art of flocking, in fact, was disused, and almost lost, during a period of twenty years, and revived only about sixty years ago.

There were formerly three modes in which paper-hangings were manufactured—by printing the outline with blocks and then colouring by hand, by stencilling, and by blocks alone. The first of these methods is that adopted by the *dominotiers*. The second, stencilling, is performed by cutting out either on paper, leather, or other materials, the pattern to be represented, and then placing this on the proposed ground, and brushing it over with the proper colour. This mode gives an imperfect outline, and is seldom used, except by plasterers, to ornament coloured walls. The third is the mode now almost universally adopted, whereby every colour is applied by a separate block, according to the tints and shadows intended to be represented: but within the last two years a great improvement has been effected in this mode of paper-staining, by using several colours on one block, which is a great saving both in labour and cost, besides producing a more effective article at the same price. The Messrs. Potter, we believe, were the first to introduce this improvement, which has since been successfully followed up by Messrs. Hinchliff, who, on some occasions use as many as twenty-five colours on a single block, the effect of which, upon the labour cost of the article, may easily be conceived.

The contributions to the Exhibition, in this branch of industry, are peculiarly rich and diversified: and, as was to be expected, France, if we may be allowed such a metaphor, is the radiant star on the horizon. The specimens of M. Delicourt, Mader Frere, and Genoux, leave our manufacturers at a considerable distance, as regards the highest class of paper-staining.

The papers in the Russian contribution were more curious than effective in style and execution; in almost every respect they were inferior to those from Austria, and much below those of Belgium, France, and England. America, we think, is about upon a par with Russia in this respect.

In 1754, Jackson, of Battersea, a manufacturer, published a pamphlet the invention of printing in chiar' oscuro, and its application to pap hangings, which he executed in imitation of the most celebrated clas subjects; and various attempts have since been made in the same path: t last, and one of the boldest, is that of Jeffrey and Allen, who have us what they considered the best portion of the Elgin frieze, in twenty-fo feet of length.

Scott, Cuthbertson, and Co., showed a simple and handsome Tud panelling in the Eastern Gallery. The effect of the gold upon a wh ground, as the paper was hung, was necessarily much softer than the drawi would suggest: the border, however complex, is by no means confused; mu of this may be owing to the quantities of colour, which, as in their otl paper, is a bold attempt at reconciling apparently equally forcible colou

Turner's *cerise* is particularly elegant and lady-like. These patte demand unusual attention, on account of the precision claimed for manual labour of printing the blocks. The test is very simple, and same part of the sheet of paper may receive ten or a dozen blows from blocks without slipping, or causing a faulty impression. This pattern design by Marchand of Paris. Underneath it were two patterns, wh possess the property of altering their appearance as the eye of the specta moves, becoming alternately light on a dark ground, and dark on a li ground patterns. This effect of "glancing," as it is now termed, has been introduced by this house so much as twelve months, and is st novelty.

Townshend, Parker and Co. had an arabesque paper pattern, quite g enough for hand painting. This certainly stands a chance of being conside the most praiseworthy of this class of productions. Their plain flock each side of it gain by the contrast: for their purity and neatness of out joined to the solidity of the flocking, are well set off by the general tones of the arabesque.

FURS, SKINS, FEATHERS, Etc.

(Conclusion).

CONTINUING our account of the furs shown in the Exhibition propose to notice first the seal-skin, several fine specimens of w were contributed by Messrs. Nicholay and Son. The seal is an inhab of many countries; it is found in the high northern latitudes in imm numbers, and ships are purposely fitted out for its capture; and th obtained from this animal, together with its skin, renders it (connect it is with the whale fishery) extremely important to the trader, an teresting to the naturalist. The skins are salted and packed in cask which state they are sent to this country; they are then sorted and sel for various purposes; those suitable for leather pass into the tanners' h and make a beautiful material which is used for ladies' shoes. The back, the hair, and the silver seal are dressed and used in their natural and are also dyed and exported in large quantities; their low price durability cause them to be in great demand. The fur seal, the sup which is always small compared with other kinds, undergoes a proc prepare it for general use. It is brought at the present time to a deg high perfection in this country. When divested of the long coarse (which protects the skin in its native element) there remains the rich, silky, yellowish down, in which state it was formerly used for trav caps and other purposes. It is now seldom made use of in this stat is dyed a beautiful Vandyke brown, giving it the appearance of the r velvet; and it is manufactured in every variety of shape and form articles of dress for ladies', gentlemen's, and children's wear.

Passing from the seal skins we next observe several groups of chilla. The chinchilla is exclusively a South American animal. its introduction into this country and France, about forty years since, continued to be a favourite and fashionable fur. Its extreme softne delicacy confine it to ladies' wear. It has lately been largely exporte this country to Russia and Germany, where it is greatly admired, bastard or Lima chinchilla is a short, poor fur—altogether very infe the other, and often, to those who are not judges, substituted fo superior kinds.

Leaving the northern latitudes and the New World, we direct our att to the skins from the tropics, such as lions', tigers', leopards', panther several fine specimens of which were shown in the Indian departm well as by individual exhibitors.

In China, the mandarins cover the seats of justice with the skin tiger. In this country, the use of the leopard's skin under the o saddles is a mark of military rank adopted in some of her Majesty's regiments. In Austria the small fine leopard's skin is worn as a ma the Hungarian noblemen of the Imperial hussar body-guard.

Of buffalo robes, or skins, several specimens were exhibited. The is killed in immense numbers by the North American Indians, sol the tongue, the skin, and the bosses. They have a peculiar met dressing the skin with the brains of the animal, in which state it is imported. It has of late years been much used in Europe and this c as a warm travelling wrapper, its moderate price placing it within th

most all classes; and in the colder climates it is similarly used also for h wrappers, and cloak and coat linings.

om Asia Minor we had specimens of the skin of the Angora goat, which oduced in large numbers in that part of the world, and is remarkable s long, curly, rich, white silky coat. It was formerly a most costly ashionable article of ladies' wear, but it is at the present time of little . When dyed it takes some of the most beautiful and brilliant colours. ow price has caused it to be adapted to weaving purposes with ss. It is frequently made into very beautiful rugs for drawing-rooms, ges and other purposes.

may be interesting to state the manner in which the skins are brought e state in which we find them exhibited. They are imported to this ry from all quarters of the globe, but principally from the territories e Hudson's Bay Company, Canada, Siberia, North and South America, any, and other parts. The dealers have first to examine them in the in which they are actually taken from the animal's back; they are sent to the "dressers," where they are first placed in large tubs, what resembling wine casks; salt butter is then applied, and the are stamped upon by men; and they next go through a process d "fleshing," which consists in drawing them rapidly across a somewhat resembling a chaffing knife, for the purpose of getting all extraneous substances. They are then "tubbed" again, with an ation of mahogany sawdust, in order to remove the grease not taken the formation of leather. The skins then return to the manufacturer, o by him delivered over to the "chamber-master." These men are pally Germans; but of late, we understand, our own countrymen ucceeded in equalling their foreign competitors. Another important n of this trade is the process of dyeing. Of course it is here that the st amount of deception is practised, and the art of dyeing skins has been brought to so great a state of perfection that anybody not tely acquainted with the article could be most easily deceived.

class in which furs and skins are exhibited also includes feathers, incipal British display of which was by Messrs. Adcock and Co. g their collection of feathers for dress, in a handsome glass case British nave, were the several varieties of the feathers of the ostrich, l and undressed, which vary in quality according to soil and climate. were some of the finer sorts, such as the Aleppo and Mogador, made lumes, as used by the Knights of the Garter, the Knights Grand s, and the King's Champion at the coronation of George IV. These s were also shown formed into a variety of Court plumes, such as een worn since the beginning of the century up to the present time, g the alterations in the fashion during the last fifty years. Some of ck feathers—which come from the back and wings of the bird—are nto plumes for military purposes, as used by the Highland regiment; are dyed in brilliant colours, and, to show the perfection of the art, colours are produced upon the same feather—a process never ted until within the last twenty years. There were also specimens he marabout stork (*Leptoptilus crumeniferus*) made into plumes and , with the feathers of the scarlet ibis, which have a very pretty some of these were also dyed various colours on the same feather. were likewise some knotted and made into trimmings, with gold, e for dresses a work of great time and patience, as every knot has tied separately. Some of the grey marabouts were dyed black, in this description of feather, is a colour very difficult to produce. thers of the birds of Paradise were in great variety, both in their state and dressed for ladies' use; some were dyed different colours, f which, considering the natural colour of the bird (which is a bright re very difficult to accomplish—as, for instance, the purple and rose , as well as the mixed hues, which are not very often seen.

e plumes made from the feather of the rhea, or South American were also to be found among the collection. These feathers are called by the plumassiers "vultures," and are used for a variety of s—some for military plumes, others for ladies' wear. There were feathers of the emu, which are much prized on the continent, and e known as the *plume de casoir*. The feathers of the heron (*ardea*), which are used by the Knights of the Garter, are very valuable, o their scarcity—a small plume being worth fifty guineas. The of the plotus aulinga (*plumes d'auligna*), a rare feather, also were t variety, some mounted with gold and silver. These feathers are tly called heron plumes, and are worn by persons of rank in the Besides these, there were the feathers of the large egret, which are the officers of the hussar regiments. There were also the feathers small egret (*herodias garzetta*), some dyed in different colours; the of the scarlet ibis, in the form of wreaths; also those of the argus t, made into screens, and the feathers of the peacock. We had some from the common cock, made into a variety of plumes, as hose of the turkey, the swan, and the eagle; the latter are used in land costume.

interesting specimens of the Grebe (*Podiceps cristata*) were to be he fur department. This is an aquatic bird inhabiting most of the es in Europe. The choicest specimens are from Geneva, Italy, and . The feathers are of the richest white, having the appearance of silver, the plumage on the outer edge of the skin being a rich dark it is used by ladies, forms a most beautiful and elegant article of d is worn as trimmings for the trains of court and drawing-room for muffs, cuffs, boas, &c. It is very durable; the exquisite ess of the feathers prevents its soiling with wear.

We next notice the beautifully soft and elastic down known as the eider down. The bird from which this substance is taken is found in large numbers in Iceland, Norway, and Sweden. Its colour is dark grey, and its elasticity, lightness, and resistance to wet, are prominent amongst its other advantages; it is used for the inside stuffing of muffs. On the continent the well known eider-down quilts are, on account of their lightness and warmth, considered almost indispensable to bed rooms. The eider down is applied to wearing apparel; by being placed immediately under the lining, and quilted, it forms one of the lightest and warmest articles of dress both for ladies and gentlemen.

Goose-down is manufactured to a considerable extent in Ireland, by being sewed on textile fabrics. The article has been patronised and sold in England extensively, for the benefit of the poor Irish women, by whom it is made up. The price, compared with the true swansdown, is very moderate. Being sewed upon cloth, it can be washed; on the contrary, swansdown must be placed in the hands of the furrier when required to be cleaned.

A specimen of the ornithorhyncus, or duck-billed platypus, a native of Australia—one of the most extraordinary animals in nature—was exhibited by Mr. Ellis, of Fore-street. The skin is very much like that of the otter, and seldom exceeds twelve inches in length; the supply is very limited. The animal is a sort of connecting link between the bird and the beast—having the claw and body of the latter, and the bill and web foot of the duck. The male is furnished with two powerful spurs on each hind leg, similar to the game cock. The female lays eggs, which she hatches, and then suckles her young brood—which extraordinary fact was not generally credited till, some years since, preserved specimens of the creature were brought to this country, and submitted to the late Sir H. Halford, who dissected them and delivered a lecture thereon at the College of Physicians, when this circumstance was first made public. Many attempts have been made to bring them to this country alive, but without success.

In the Cape of Good Hope department a tippet was shown made from the feathers of various Cape birds. From Van Diemen's Land some feathers from the mutton bird, or sooty petrel (*puffinus brevicaudus*) were shown. They are well adapted, and are much used in the colony, for pillows, bolsters, and mattresses. From the immense numbers of these birds which resort to the islands in Bass's Straits, and the profusion of feathers with which they are clothed, there would be no difficulty in obtaining the latter in any quantity that might be required. When better known in this country, it is not unlikely that they will prove a profitable article of export from the colony.

In the foreign department the display of feathers was very limited. Those more particularly worthy of notice were two splendid heron plumes, contributed by MM. Perrot, Petit, and Co., of Paris, of the value of 3000f. each, and some very fine bird of Paradise feathers. There were also some fine specimens, adapted for ornaments for the mantel-piece, for head-dresses, and screens, exhibited by M. L'Huillier and M. Lodde, of Paris.

Sir W. S. Harris's Lightning Conductors for Ships.—Among the nautical inventions were exhibited practical models to illustrate the system of Conductors, invented by Sir W. Snow Harris, and now employed to protect the ships of Her Majesty's Navy from Lightning. In the principal model, is shown the line of conduction on the masts from the vane-spindle to the step; to the keel at the sides, and at stem and stern; and in the other models are seen the plan and construction of the conducting-plates, showing the alternate jointing of the plates, &c. Copper is selected as the best conducting metal, and is in rods three quarters of an inch in diameter; each mast having its conductor, "permanently fixed and connected with bands of copper passing through the sides of the ship, under the deck-beams, and with large bolts leading through the keels and keelson, and including, by other connections, all the principal metallic masses employed in the construction of the hull. Under such a system, a discharge of lightning falling on a house or a ship, finds its way to the earth or the sea, without the possibility of danger. The great principle in applying such conductor, is to place the ship or building in the same electrical condition it would assume supposing the whole were a solid mass of metal, or as nearly as may be; and the conductor should be applied so that a discharge of lightning falling on the general mass cannot enter upon any circuit of which the conductor does not form a part." Since these conductors have been employed in our Navy, no damage from lightning has been recorded.

CHIMNEY ORNAMENTS IN BRONZE.—LEROLLE FRERES.

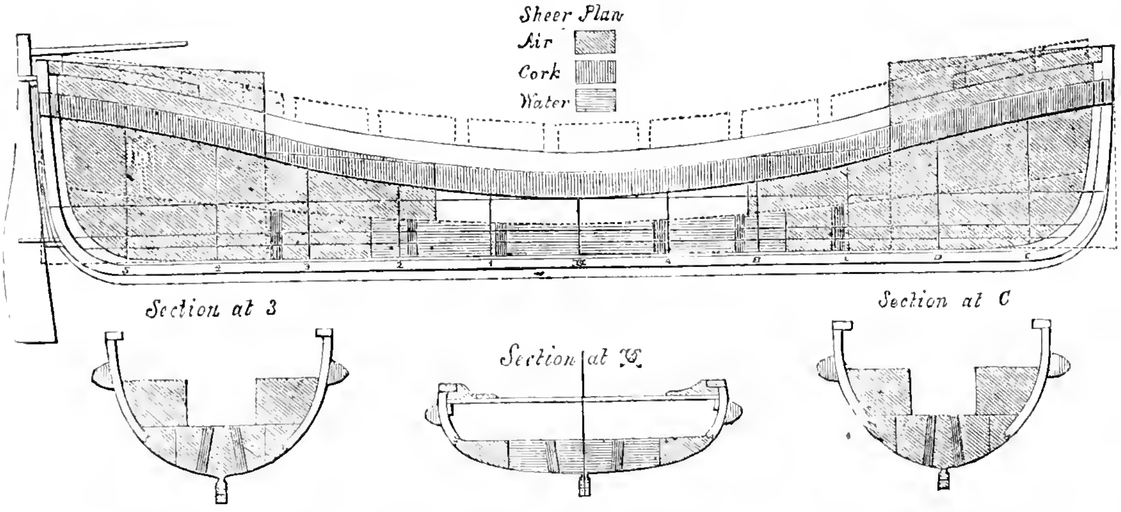
(*Engraved in our last Number, p. 224.*)

This is a very elaborate composition, which makes a considerable step in advance of the ordinary resources of decorative art. The centre group represents the conversion of a Moor to Christianity; the dignified, earnest, and chivalrous bearing of the Christian knight, who is pointing out the truths of the gospel, and the deeply reflective and conscientious character of the countenance of the Moor, being admirably embodied. On either side are a knight in armour, of noble mien, and a Moorish slave bearing his gloves. The accessories throughout are appropriate, being in the Moorish style. The whole is of bronze, enriched with paintings in silver and gold.

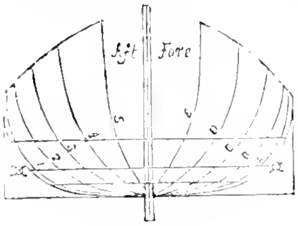
LIFE-BOATS, AND LIFE-PRESERVING APPARATUS.

LIFE-BOAT MODELS.

THE general characteristics of the Life-boats exhibited take for their common principle of buoyancy the construction of an air-tight lining in the interior of the boat—the space between the outward and the inward sides of the vessel gradually widening until a very broad gunwale is formed. In other specimens, the air-tight cell is placed lower, running in the form

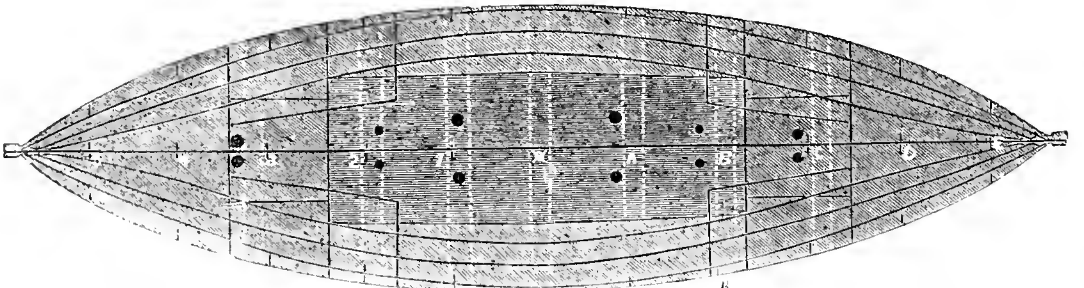


of a square or circular box round the boat, but beneath the thafts or seats. A few specimens are fitted with those cork belts and furnishings, which keep the boat nearly as buoyant as air-tight tanks would do, and certainly, from the additional advantage of not being rendered useless by an accidental blow from a sea against the wreck. This danger, however, is sought to be guarded against by the construction of several air-tight compartments—any of which, we are generally assured, would suffice to keep the boat, with her crew, above water.



Body Plan

There were several adaptations of Surf-boats, built open beneath, the buoyant agency being placed entirely in the sides, thus letting the seas break in and out—the level in the water of the boat being never altered: the bottoms of some of the life-boats consist merely of cross-bars on which to



A. Water Tank. B. Air-tight Deck; the spaces below are divided into air-tight compartments. C. Diagonal Air-tight Cases. D. Air-tight Seats, enclosing air-tight compartments for dry provisions. E. Tubes with Valves for emptying the water out through the bottom. F. Screw Valves to admit water into the Tank A. G. A Belt of Cork. H. A Pump to draw water out of the Tank. I. Compass. K. Inner Skin, air-tight.

rest the men's feet; while in others there is a flat flooring, only connected, however, by pins and bars with the closed sides of the boat.

The United States showed several Surf-boats, or oblong spherical cases of metal to contain air, for passengers to be conveyed in them, for a short transit through the breakers. A number of the Life-boats were on the wheels and were built for port and ship, as well as for coast service; and for hanging in davits, as well as for being hurried across the country.

The long shallow shape of the boats was universal; and they were constructed alike at stem and stern, so as to avoid the dangerous necessity of going about. A few had rudders fitted on, but oar-steering appears to be more generally practised; the rowing-oars being generally attached to pins on the gunwales, so as to allow them to swing. An ingenious att to get rid of part of the difficulty of rowing in a sea-way from the m of the craft, was in the model of a Boat within a Boat—the former swi freely in the latter, and always preserving its equilibrium, in spite o rolling of the outward vessel.

In a Life-boat from the Isle of Wight, the planks, instead of running and aft, were laid diagonally across, from the gunwale to the keel. A W Boat was furnished with outriggers supporting nets, into which p might leap from a ship, while the boat was kept at such a distance diminish the risk of her being swamped against the wreck.

The Lowestoft and mouth Life-boats their buoyant appara the sides beneath thafts: the oars d banked, and beside man is a pump for g rid of a sea when the boat. A label att to these boats, state they are in use over a of coast of about t miles'; that not one o has ever been upse that they have save 500 to 600 lives. Th fallible Life-boat" whimsical constructi tirely open at the b and made, indeed, after the same fashi tom and top. A Lan Life-boat is remarka the horizontal cuts gitudinal opening loop-holes, piercin sides in continuous lines; beneath she is open to the water.

Holbrook's Iron Bottomless Life-boat, 26 feet long, was exhib model: it is made entirely of wrought and sheet-iron, lined and c with strong netting: it has six floaters made of sheet-iron, filled with formed into air and waterproof barrels, with tanks for 222 gallons c water; provisions, warm clothing, compass, alarm apparatus, fuel, fire rockets, and 1000 feet of line; and in the figurehead, a kettle that w in ten minutes. The boat is secured together with 400 screws and and 10,000 rivets: total weight, 20 cwt. Having no bottom, this b scarcely capsize; should its floaters let in water, the barrels insi remain buoyant; and it will carry nearly 150 persons, and food for ma

Bonney's Life-boat, which has been experimented on in the Ser and the Thames with unvaried success, was also exhibited: it is clinke the sides are doubled from the bilge to the spar-deck, and filled wit percha water-tight cells; and the fore and aft parts are divided int tight compartments. This boat has sailed full of water withou diment; and being hauled over and then half filled with wat released, righted itself immediately. It rows or sails equally w ways, and the plan is applicable to boats already in use.

Among the n were two Life-bo Erskine: one prop new pinion-wheels acting syphon pur other fitted with r air-tight cylinders, tecting rings, &c.

Hely's Catama Life-float, was ex it is composed o proof canvas cy cases, filled with clothing, provision &c. The same i contributed a Salv wholly formed o tubes, serving a spherie and b chambers with loa and self-shifting w

Here, too, we South Shields Life-boats, completely fitted with sails, &c.; a Whi boat, capable of emptying itself of water in four seconds, by two a in the bottom; and a Life-boat of wood and cork, with gutta-percha compartments, and scuppers in the keel for letting out water. Aberdeen "Momentary-motion Life-boat," was exhibited: it is state sess the self-righting power under all interruptions. Alowing 65¼lb weight per cubic foot sustained by this or other air-tight vessel, 247 cubic feet will float a greater number than such boat can cont the same buoyancy is maintained, however placed. When inverted, will float on her fore and aft air-cases, thus preventing the contact ship gunwale with water, whereby little water is left to displace.

ne's Life-boat is built with diagonal battens, laid lattice wise; its outer hing formed of gutta-percha; its buoyancy is 350 cubic feet of air, le of sustaining upwards of 9½ tons, and letting off shipped water by holes; in the convexed bottom are three perforated steadying fins, and en them 2 tons of water, not one ounce weight to the boat when t: there are also galvanised springs placed at the stern, to act like y-buffers in collisions; besides fusees, rockets, and other lights. The inventor exhibited a Portable and Folding Emigration Life-boat, to be requisition in a few minutes; and, in wreck, to carry provisions for orsons seven days.

Patent Collapsible Life-boat was exhibited by the Rev. E. L. Berthon, stated to enable passenger vessels to take to sea enough boats for any ency, without crowding the decks: they are always ready for use, ped to under the davits;" and, on casting off the gasketts, the boat pen, and takes into fore and aft cells a large supply of air.

THE NORTHUMBERLAND PRIZE LIFE-BOAT.

l be recollected, that in October, 1850, in consequence of the acci- that had happened to life-boats around the coasts of Great Britain, ore especially the lamentable case off Shields, in December, 1849, by the upsetting of the life-boat, twenty of the best pilots out of the were drowned, his grace the Duke of Northumberland offered a l of one hundred guineas for the best model of a life-boat, the being that 280 models and plans were sent to Somerset House for tition.

r a laborious examination of the several models, the six boats that first on the list were, for the third time, placed side by side, their l points again examined, and the models carefully compared with ther; the result was a confirmation of the former numbers, and to ames Beeching, boat-builder, of Great Yarmouth, was adjudged the um for the best model.

report of the committee appointed to examine the models is a very tant and interesting document; and, besides recapitulating the r features of several of them, details the requisite qualities of a t; the accidents to life boats; the number of shipwrecks on the of the United Kingdom; the life-boat, rocket, and mortar stations; eritorious conduct of the coast-guard service; and suggestions for sing the number of wrecks, &c.

have engraved the prize boat in detail, of which the following is the description:—

body of this boat is of the form usually given to a whale-boat—a y rounded floor, sides round in the fore and aft direction, upright nd stern-post, clench-built, of wainscot oak, and iron fastened.

gth extreme, 36 feet; of keel, 31 feet; breadth of beam, 9½ feet; 3¾ feet; sheer of gunwale, 36 inches; rake of stem and stern-post, es; straight keel, 8 inches deep. The boat has 7 thwarts 27 inches 7 inches below the gunwale, and 18 inches above the floor; pulls 12 ouble-banked, with pins and grummets. A cork fender, 6 inches y 8 inches deep, runs round outside at 7 inches below the gunwale.

a buoyancy is given by air-cases 20 inches high in the bottom of at under the flat; round part of the sides, 24 inches wide by 18 deep, up to the level of the thwarts, leaving 10 feet free amidships; the head and stern sheets, for a length of 8½ feet, to the height of nwale: the whole divided into compartments and built into the also by the cork fenders. Effective extra buoyancy 200 cubic feet, to 8½ tons. For ballast, a water-tank divided into compartments, in the bottom amidships, 14 feet long by 5 feet wide and 15 inches ontaining 77 cubic feet, equal to 2¼ tons when full, and an iron keel cwt. Internal capacity of boat under the level of the thwarts, bic feet, equal to 5 tons. Means of freeing the boat of water, through the bottom, 8 of 6 inches diameter, and 4 of 4 inches er—total area, 276 square inches, which is to the capacity in the tion of 276 to 176, or as 1 to 64. Provision for righting the boat if 2¼ tons of water-ballast, an iron keel, and raised air-cases in the head rn sheets. Rig, lug foresail and mizen; to be steered by a rudder; ber heads for securing a warp to. Draft of water, with 30 persons rd, 26 inches. Weight of boat, 50 cwt.; of gear, 17 cwt.; total, 67 Would carry 70 persons. Cost, with gear, 250*l*.

form given to this boat would make her efficient either for pulling ng in all weathers; she would prove a good sea boat, and in places s Yarmouth, where there are always plenty of hands to launch a er weight would cause no difficulty. By means of the raised air- laced at the extremes, the absence of side air-cases for a length of amidships, the introduction of 2¼ tons of water-ballast into her when afloat, and her iron keel, this boat would right herself in the f being capsized; although from the form given to her it is highly able that such an accident should occur.

ssage should be left in the air-cases to approach the stem and stern, many occasions the only way in which a life-boat can go near a is end on, when the crew of it must be received either over the the stern. The deep keel, 8 inches, however favourable for sailing, dying her in a seaway, and for aiding her in righting, would be a ntage in beaching, and would render the boat more difficult to turn of wishing to place her end on to a heavy roller coming in. The the delivering valves is large in proportion to the internal capacity, ld rapidly free the boat of water, down to the level of her draft, with her crew on board, would not be to less than to a depth of some inches above the floor. The air cases are built into the boat, which renders them liable to accidents; if this were remedied, and her internal capacity reduced, a 30 feet or 32 feet boat built on similar lines, with her internal fittings slightly modified, would make an efficient life-boat, adapted for many parts of the coast.

One day in November last this prize-boat made a trial trip out to the Goodwin Sands, and proved herself of the most extraordinary qualities as a sea boat. Captain Charlwood, the inspecting commander of the district of the Coast Guard, with Lieutenant Simmons and Mr. M'Donald, the master of the *Rose*, revenue cutter, and a crew of 14 picked men, went out in her to the Goodwin, where she was placed in such positions as to allow the surf to have the greatest effect upon her. Nothing could exceed the admirable style in which she behaved; and enough was seen to satisfy the officers and men who were in her that she would weather the most tempestuous sea. Her sailing qualities were also tested with the most successful results; indeed, it is said that if it were possible to throw her on her beam ends she would not go over. Such was her buoyancy, that when filled with water she cleared herself to the grating in about twelve seconds. The success of the boat has been the source of much gratification along the coast.

LIFE-PRESERVING CONTRIVANCES.

A VARIETY of buoyant Articles of Clothing were exhibited: they may be worn as every-day clothes, and include "Yatching jackets," and ladies' paletots, described as capable of supporting the wearer in the water. Many other means of support in the water were shown; such as belts, to be inflated by the mouth, and lumps of cork, threaded like beads, to be put round the body. Waterproof trunks, made so as to serve as supporting media in the case of shipwreck, were exhibited, with models illustrating their easy adaptation to the purposes of rafts. Air-tight mattresses were shown, suitable for hammocks and berths, and which, of course, are exceedingly buoyant; together with "floating buoyant settees," (with air-tight gutta-percha cases,) for the decks of passenger steamers; and a marine floating-chair for three persons.

There were likewise exhibited Carte's Life-Buoy (circular belt); Swimming-Gloves, web-fingered; and Swimming-Boots, the soles fastened to flat pieces of wood, to which are attached flaps or leaves working by hinges; India-rubber-cloaks, capable of being inflated, when they become small buoys or boats; and Caulcher's Cork-ribbed Jacket, to be worn, without inconvenience, whilst rowing a boat.

In the American department were several buoyant contrivances, made of vulcanised India-rubber, for saving life under peculiar circumstances.

The Apparatus of the Royal Humane Society was exhibited; including their Ice-boat, constructed of wicker-work, covered with raw hides, and from its lightness easily propelled on the ice to the broken spot; the Breaker Ladder, with air-tight barrels, on wheels; the Ice-sledge—two canoes united by thwarts into a floating platform; Rope-drag, and Pole-drag, the latter by an air-tight cylinder rendered a floating-drag. Here, too, were exhibited the Life-boat and models of the National Institution for the preservation of life from shipwreck. There was also shown Light's invention for rendering ships' boats so buoyant that they become life-boats; by filling the spaces between the timbers and beneath the thwarts with a very light material, and covering it with thin boards; and should the bottom be stove in, the frame, held together by the fibrous material, would float as a raft. The process can also be applied to any part of a ship, or boat, its mattresses, or other furniture, so that each may become a life-buoy.

Grapnel Shots, with mortars for their projection, to aid wrecks, were exhibited. The shot has attached to it a strong but light line; and consists of loose curved arms, which fly out on being disengaged from the gun: when the line being pulled from the shore, the implement fixes in the bottom, anchor-like, and the boat's crew have the means of warping themselves off. Of the same class is the Rocket-gun, for carrying a 600-yard line from the shore to a wreck, or *vice versâ*. Another model proposes to project a small anchor to the wreck; another to propel a line without the use of gunpowder; and next were shown the Life-boat and mortar apparatus of Captain Manby, the venerable patriarch of this family of humanities.

THE FRENCH INSTITUTE AND THE GREAT EXHIBITION.

(*Concluded from page* 211.)

FRANCE has shown in a less general and complete manner; and it is to be regretted that several of our trades can only be judged by the recollection of our Expositions. The vigilant severity of the jury has not allowed mediocrity to present itself. Thus all our articles are remarkable for the discernment with which they have been chosen. Our machines, though few in number, are real masterpieces, which have excited the admiration of the English themselves, and which prove the degree of development which constructive industry would attain in France if it could obtain the raw materials at the same price as our rivals.

Our mathematical, astronomical, surgical, and horological instruments excel all others, except, perhaps, the Swiss clock-work, the makers of which have discovered the means of producing excellent watches upon a large scale by the aid of processes peculiar to this ingenious nation, which deserve particular mention. Our chemical products have sustained their ancient reputation.

But it is, above all, in the manufacture of woven fabrics of every kind that France has displayed a power, and, if we may so speak, a flexibility of production which are incomparable. If she has still left something to be desired in the spinning and weaving of cotton, she owes this inferiority only to the high price of fuel and iron. Each day, however, she tends more to compensate for what she lacks on this head by her capabilities in printing the fabrics, and her increasing supply of new and tasteful designs for these fabrics, for shawls, and still more so for silks. In the latter manufacture the town of Lyons has even surpassed itself at the Great Exhibition.

The Lyons manufactory represents in a marvellous degree the fate worked out for branches of industry, the most characteristic of French genius, by the system which protects certain of them to the real detriment of all the others. Five-sixths of the special produce of Lyonese manufacture have been from time immemorial sold to foreigners, especially England and the United States. The power of exchanging its commodities for foreign merchandise is, therefore, an absolute necessity—a question of life or death to this town. And when we consider the importance of such a manufacture, the influence which it exerts upon the production of silk, and the grand traditions which it is called upon to maintain, we shudder to think that it exists from day to day at the pleasure of a system of legislation which has procured for us reprisals, of which this branch of trade bears almost the whole burthen.*

France wounds itself by closing its doors, and by sacrificing to certain branches of industry its surest elements of fortune, its artistic manufactures, or, in other words, those most eminently French. France is, in fact, at the present day, the country most interested in the freedom of commercial relations —the one to which this freedom would work the greatest good, to which restrictions work the greatest ill. This may be judged of by her works compared with those of all the foreign countries. All that she manufactures is enriched with an exquisite taste and with inimitable art. Whatever of her products are dear, are so on account of the extraordinary and fictitious charges with which they are burthened for the profit of some privileged branches of the manufacture, and not of the manufacture itself.

Whilst we shall gradually bring under the notice of the Institute the other facts confirmative of this state of things, the consequences will unfold themselves. Everywhere we shall see the spirit of commercial freedom to labour, the fatal spirit of restriction, in opposition to opinions as to the well-understood public interests.

Having described to the Academy the distinctive characters of French and English industry, it is fitting that we should inquire what has been the part played by the nations at this universal concourse. Several of them have shone there with remarkable brilliancy, and have displayed there collections of riches of the most interesting and most varied nature. Germany, represented by the Zollverein, occupies the first rank after France and England, and she owes it evidently to the modifications which have been effected in the custom-house legislation of the celebrated association founded and patronised by Prussia. The brilliant collection sent by this union to the Universal Exhibition bears incontestable witness to the happy influence of liberal reforms upon industrial production, for this collection comprises the same elements of fortune, in more limited proportions, as those of France and England. The Zollverein has especially distinguished itself by the skill displayed in the working of metals; and perhaps, if we were to judge only by the perfection of certain articles, we should be right in saying that this perfection is more unapproachable in the articles sent by Prussia than in those of any other nation.

Germany advances day by day in the career of the arts, as applied to manufacture. She still lacks in regard to riches; and capital she makes up for by the frugality of her workmen, by the cheapness of living, by the low price of raw materials, and the perfection of means of conveyance in Germany. The Germans invent little in manufacture, but they imitate excellency, and they are perfect patterns of order, prudence, and economy. They excel, as we have seen, in the working of metals, which is the starting-point of all the other branches of industry, and they walk side by side with England in articles of ironmongery, and in the manufacture of a host of utensils of every-day consumption. Their porcelains, their glass, their woven fabrics, their typography, their topography, their paper and leather manufactures, their carpets, their musical and philosophical instruments, and their manufactures of chemical products, have attracted general attention. Saxony has exhibited the three first sheets of an atlas, the engraving of which surpasses all the perfections of English, French, or Austrian typography. The valley of Chemnitz has sent some productions which appear, by their variety and their excellent manufacture, to unite the merits, so diversified, of our Alsace, of Roubaix, of Rouen, and of Saint Quentil. All these articles, so remarkable for their good quality, are still more so for their low price, thanks to the happy combination of the economy of machinery and hand labour.

The *naïveté* of character displayed in German works is abundantly seen in the porcelains from Saxony (so full of life and expression), the bronzes and castings from Berlin, the objects of natural history from Wirtemburg, and that infinite variety of productions of their smaller branches of industry—offsprings of hand labour and of the domestic hearth—which defy all competition and all machinery.

Austria, which country has not yet taken part in the commercial confederation of the Zollverein, has displayed a variety of productions as numerous as are the different races which inhabit the empire. Silks fr Italy, glass from Bohemia, scythes from Styria, various articles from Vie amongst which shine pieces of cabinet work more remarkable for th execution than design—these have worthily distinguished the manufact of Austria. She reckons in the Crystal Palace more than seven hund exhibitors; and like the Zollverein, more so even than the Zollverein, is distinguished by the splendour and the variety of her mineral and met productions, by her silks, her musical instruments, and her woven fab of every kind, almost all of which are remarkable, if not for taste, at l for cheapness. The art of constructing machinery has made great prog in Austria; that country, by dint of patience, labour, and economy now beginning to be able itself to produce all the articles necessary for vast network of railways which covers its territory, and for the fleet of ste vessels which Austria maintains in the Adriatic, the Mediterranean, the Black Sea.

The Imperial Printing Office of Vienna has sent a typographical collec which is without any rival in the world, including magnificent specin of works printed in more than 200 foreign languages, from the Phœni to the Japanese dialects, with rare perfection, and executed as if all these languages were regularly spoken or studied in the empire. Austria poss at the present day about 150 million types, to which she is still ad Her topography, already very honourably known by the maps of military staff, has made fresh progress, as is verified by a superb map o environs of Vienna and the course of the Danube.

In purely industrial matters Austria appears to tend, above all thing cheap production. She aspires to rival our common printed cottons; excels in the manufacture of small common shawls, of small damas furniture, of common cloths and cheap silks, in saddlery, and in wea household linen. Her curriers, her tanners, her shoemakers, and her mongers have the reputation of being conscientious and skilful work Her chemical products—some of which are entirely peculiar to Aust are esteemed for their good quality, and especially for their low Lastly, Austria, with the advantages of cheapness, seeks the more dif glory of the arts; and the articles exhibited by that country have prod a real sensation of surprise at the assemblage of qualities which they r in this nation, and their wondrous vitality and energy in making efforts even amidst such causes of disturbance as the two great wa Hungary and Italy, and the most serious internal commotions. In case, again, we are happy to find industrial progress has followed close economic reform,—moderate and reserved though it was. Let Austri for all entirely depart from her present state of intellectual, manufact and political isolation, then will she march on towards the most br future.

Our neighbour, Belgium, notwithstanding its small extent, numbe less than 500 exhibitors, and stands equal with the greatest nations l power of its capital and the energy of its spirit of enterprise. It is m a manufacturing country than any other, in Europe; the one whic proportion to its extent, has the greatest number of establishments nised upon the bases of those of France and England. Her grea companies, her zinc and iron foundries, her glass-works, and her ma tories of arms, are known to the whole world. Belgium is the nation follows most closely the development of the industrial wealth of the advanced nations, and discovers the secret of their progress with the gr perseverance and skill. Belgium, above all, works economically. means of transport in that country are perfect, both by land and coal abounds there, the price of manual labour is not high, and the i tants are robust, intelligent, and indefatigable. The entire collection she has exhibited, and particularly her laces, her weapons, her linen f are distinguished by their low price,—the lowest that could be po imagined for such works.

With Belgium finishes the list of nations organised for great ma turing productions. All the others, including Spain, Italy, and Russia, are especially producers of raw materials, or of articles ma hand, without the co-operation of machinery, at least upon a scale importance.

Spain, represented by nearly 300 exhibitors, has sent a variety of m and metallurgical products, of raw materials belonging to the vegetab animal kingdoms, and some silken, woollen, and linen fabrics whicl witness to the revival of manufactures in that country. Catalonia, from distrust of herself or from indifference or bad humour, h appeared. Amongst the recent inventions exhibited by Spain, w noticed a shawl of black blonde, with coloured flowers—a curious inno in the art of lace-making. We have also seen with much interest straw bonnets, in the Italian fashion, of most beautiful execution.

Although several branches of industry and raw products of Spai most inadequately represented in London, this country, neverthele afforded another proof of the fact, that, wherever the air of liber succeeded to restrictions, industry sprouts forth and prospers. The which might be derived from Spain is well known,—in her mercury tin, iron, and sulphur mines; her alkalies, salts, marbles, wines, rice, dye-woods, and oils, which will be spread abroad the more abunda proportion as Spain opens her frontiers more widely to the import with which they will be paid for.

Switzerland ought to have taken the precedence of Spain, if thi country could be compared with the Peninsula in the extent of its s grandeur of its recollections, and its territorial riches; for it has sh the Exhibition by a character of powerful and original simplicity,

* French silks pay in England from 12 to 20 per cent.; in the Zollverein, 20 per cent.; in the United States, 25 per cent.; 30 to 40 per cent. in Piedmont; 35 to 60 per cent. in Russia; and are prohibited in Austria.

excited and also merited great attention. Switzerland, notwithstanding difficulties of communication, arising from its geographical configuration, nevertheless proved how much may be produced amongst a laborious ple by the spirit of economy, patriarchal industry, patience, and the peration of all the domestic powers to the success of the common work. otwithstanding the utter absence of Protection, the manufactures of , of woven fabrics, and of ribbons, which have been established at ch and Bâle, her embroidered muslins, and her watches and clocks, no competition; and on the borders of her lakes are constructed steamnes which are sold at a profit in Italy, in France, and even in Germany. vitzerland owes this rare privilege to the faithful observance of the amental laws of production. Capital is abundant there: the division bour is well observed without being pushed to the extreme; and the lish principle of small profits, incessantly repeated, favours the growth ealth beyond all expression. The simple mode of living of the master smen, the activity of the workmen, their frugal habits, and their evering tendency to saving, enable this people to hold their favourable ion. Switzerland is, at the present moment, a subject for study full terest to economists, and a striking example of what can be effected by pirit of order and economy in the humblest households and in the lest countries.

ly, entirely devoted to the arts, is represented by Piedmont, Tuscany, bardy, and the Papal States. Naples and Sicily have sent nothing. products of the Peninsula do not belong to the same category as the es manufactured in the industrial arsenals of France and England. Italy o social questions to resolve on this head: but few large factories, and machinery, are to be seen in that country. Silk and silken fabrics pose the chief part of the Exhibition; and I must make the passing rk, that the town of Genoa is distinguished there by velvets of most rable beauty. Some beautiful mosaics; some rich inlayings upon , many of them very remarkable, exhibited by the town of Nice; oils first quality, some excellent chemical products sent by Tuscany; iron the island of Elba; several musical instruments perfectly made, some beautiful anatomical models in wax, and some very graceful specimens lpture and carving—such is the assemblage of articles come over Italy to the Universal Exhibition, of which Tuscany has furnished the pal elements. The rest figures beneath the banner of Austria and that Pontifical Government.

contributions furnished by the different Italian states, modest though rc, bear certain witness to the revival of industry, and furnish a d of hope for Italy's future.

e same may be said of Turkey, which is represented by a real encylia of products, exhibited in a mass, in the name of the Ottoman rnment, composed of more than 3000 specimens of raw materials, e, and for medicinal and dyeing uses; which are extremely remarkable eir variety, their quality, and some of them for their novelty. Mussulman loxy has not prevented the commissioners from adding to its collec22 varieties of wines from Syria and Asia Minor, from which, however, not think competition is much to be feared by our vineyards. Lastly, y has exhibited above 1200 manufactured articles, comprising s entirely of silk or mixed with cotton, veils, girdles, female ng of all descriptions, clothes embroidered with gold, fabrics of goats' saddles, shawls, muslins for turbans, state costumes, worked skins, rich variety of kitchen utensils, of pottery, of weapons, of pipes, and nmongery, forming a domestic museum most adapted to display the ial state of civilisation in the Levant.

It s evident that the East is in course of change, and that this country the way again to discover the primitive sources of its ancient wealth; urope cannot pay too much attention to this seat of production of a f raw materials indispensable in her manufactures, and to several products which are executed with as much solidity as economy. thanks to the cheapness of the wools, of the dyeing substances, and nual labour, Turkey has succeeded in imparting an immense impulse manufacture of Smyrna carpets, of which there is at the present day important consumption in England. These velvet carpets, which st for fifty years, have been introduced into Great Britain since the mic reform: and, so far from being an injury to the English carpets, are slight and not very durable, they have given an impulse to the acture of these carpets by spreading widely abroad the taste for this article of furniture.

pt and Tunis, subsidiary provinces of the empire, have also sent their to the Crystal Palace. Their collections consist principally of raw als to the number of 300 or 400, comprising rice, cotton, sesame, , tobacco, essences of every kind, cereals, and vegetables without n of their local origin. The Egyptian collection, however, is far from complete exhibition of the wealth of the basin of the Nile. Not Tunis. The articles sent by that country have a character of lity and simplicity purely Oriental. These tents of camels' hair ed with lions' and jackals' skins; these colossal saddles, bristling ours like bayonets, embroidered with gold and jewels; these vases fragrant essences; these doubtful medicinal herbs; these badlyed ostrich skins; these miserable iron utensils; this splendour and igence, tell more than long pages of economic history could tell. evertheless, a ray of civilisation is seen to dawn through these ts. Algiers already influences Tunis, and the East is coming out of st into open daylight.

Denmark and Sweden have exhibited about a hundred articles, consisting, ally from Sweden, of the products of her iron mines, cannons, files, and carpets, polished steel, and ironmongery of every kind, and from Denmark, of mathematical instruments, made with great care and at a low price, specimens of pottery from Jutland, specimens of skins, japanned trays, oilcloths, &c. The productive powers of these two countries cannot be judged of by so small a number of articles; but one thing is certain, that is, that there, as in Switzerland, there exist habits of frugality and economy which enable the workman to work at a low price, and still gain a livelihood, freed as he is from the frequently fictitious wants of our southern latitudes.

Close to the Swedish and Danish exhibition figure the products of the United States of North America and those of the Russian Empire, those two great powers of the future. They are, however, but very inadequately represented. Five hundred and fifty exhibitors hardly represented the United States. The character of their products is simplicity, rusticity, and sometimes even rudeness. In all this is seen the nation of pioneers; nothing meets the eye but these heavy axes, these ploughs and agricultural implements, more remarkable for strength than for convenience; several natural substances, elementary and for dyeing purposes; woods in immense quantities; several models of boats, made of light bark; suspension bridges; travelling necessaries, sledges, skins, common glass-ware, rifles for a long shot; everything that is essential to a rude society which has commenced in the heart of forests and on the margins of lakes and great rivers. In all that relates to art and taste the Americans of the United States have not been successful. Their pianos, their mahogany furniture, their woven and printed fabrics and their cloths, their geographical maps, and their bookbinding, all bear witness to their backwardness in this respect. They have sent, together with some specimens of minerals and machinery, a host of Daguerréotype pictures, which are tolerably successful; some India-rubber pontoons, articles of fashion, hats, wigs, works in hair, and tooth-powder. Strength and whimsicality, utility and futility, appear to occupy the same rank in their estimation. In the collection exhibited by them are to be found guns with four barrels, almost ridiculous heaps of ten-barrelled pistols, and some specimens of ears of Indian corn, cereals, and vegetables of all kinds of the richest growth. Altogether the American exhibition is quite incapable of giving any adequate idea of the gigantic development of this people, whose industry overcomes the great rivers, mountains, and other formidable obstructions of nature, as the only adversaries worthy of them.

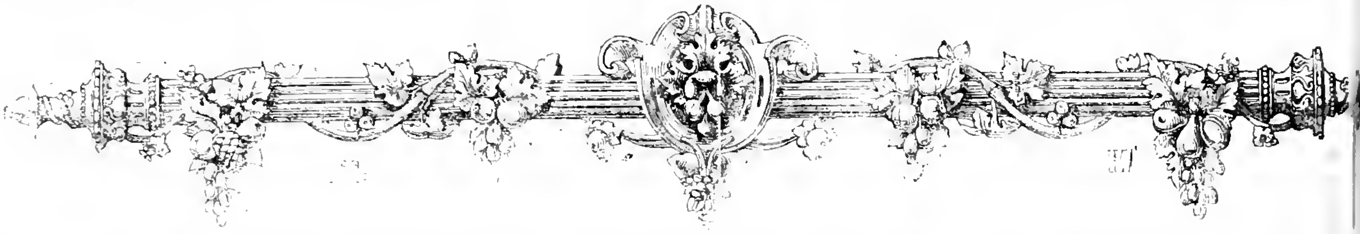
The Russians, who arrived late in consequence of the difficulties of the spring navigation of the Baltic, have paid a more solid tribute to the common festival of all manufactures than have the North Americans. Most prominently to be remarked are their beautiful works in malachite, their rich furs, their odorous leathers, their beautiful specimens of copper and iron work, and the collection of their hemps, which supply all the markets of Europe. The Emperor has sent some magnificent porcelain vases from his Imperial manufactories. Several cotton, woollen, and silk stuffs bear witness also to the impulse given to manufacture.

Such is the general character of the principal nations who have figured at the assembly of the workers of the whole world. The Exhibition of 1851, by partially raising the veil which hangs over the future, will at least have shown the most urgent necessities of the present. Every one, henceforth, will know the surest means of increasing public wealth, is to promote the importation of the raw materials of manufacture, and the cheapness of the food of the manufacturer. It is not by the brilliancy and splendour of their productions that nations prosper, but by the abundant circulation of articles of common utility.

When the details of the productions of so many different people are studied, as they are revealed by the products themselves, and by the conditions under which these nations have produced them, we are struck by the simplicity and inflexibility of the economic laws which govern them, notwithstanding the great variety in their aptitudes, their climates, their geographical situations, and their political Governments. Whatever the forms and requirements of these Governments may be, provided the fundamental laws of labour are respected, their material prosperity is invariably developed; when these laws are not understood, or shackled in their application, it perishes or languishes; and the fact has been placed beyond all doubt by the Universal Exhibition, that no nation can hope for a manufacturing future unless it walks forward with a firm and continued pace towards the lowering of the cost of production, and the amelioration of the condition of the producers.

Without entering here into details of figures, we can affirm, with a certainty that we shall not be contradicted by any exceptions, that the superiority, general and special, absolute or relative, of every nation which has appeared at the Universal Exhibition, is especially manifested in the price of articles of large manufacture. If we had to present to the Academy something more than a report—I had almost said a summary inventory—of the products exhibited at the Crystal Palace, we should have had no difficulty in making an analysis of these prices, and we should have found, in every case, high prices the consequence of Protection, and low prices that of Free Trade. England, Spain, Germany, Belgium, the Zollverein, offer us a thousand examples of this; no nation furnishes a single exception of it. Other causes, doubtless, have aided in this reduction of price, but the starting point has been the same in all nations; and all other advantages are rendered impotent, or weakened, if the chief of all be wanting—that of commercial freedom and moderate taxation.

France has been a remarkable example of this, notwithstanding all the success which she has met with this year at the London Exhibition. Never, perhaps, have her manufactures shone with more brilliancy; never have the nations awarded her with more unanimity the palm of taste;



CURTAIN CORNICE OF PAPIER MACHÉ.—JACKSON.

WORKED MUSLIN CURTAIN—SWITZERLAND. VIEW OF THE VILLAGE OF APPENZHALL.

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The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

SILVER DISH.—ANGELL.

SILVER DISH.—BY ANGELL.

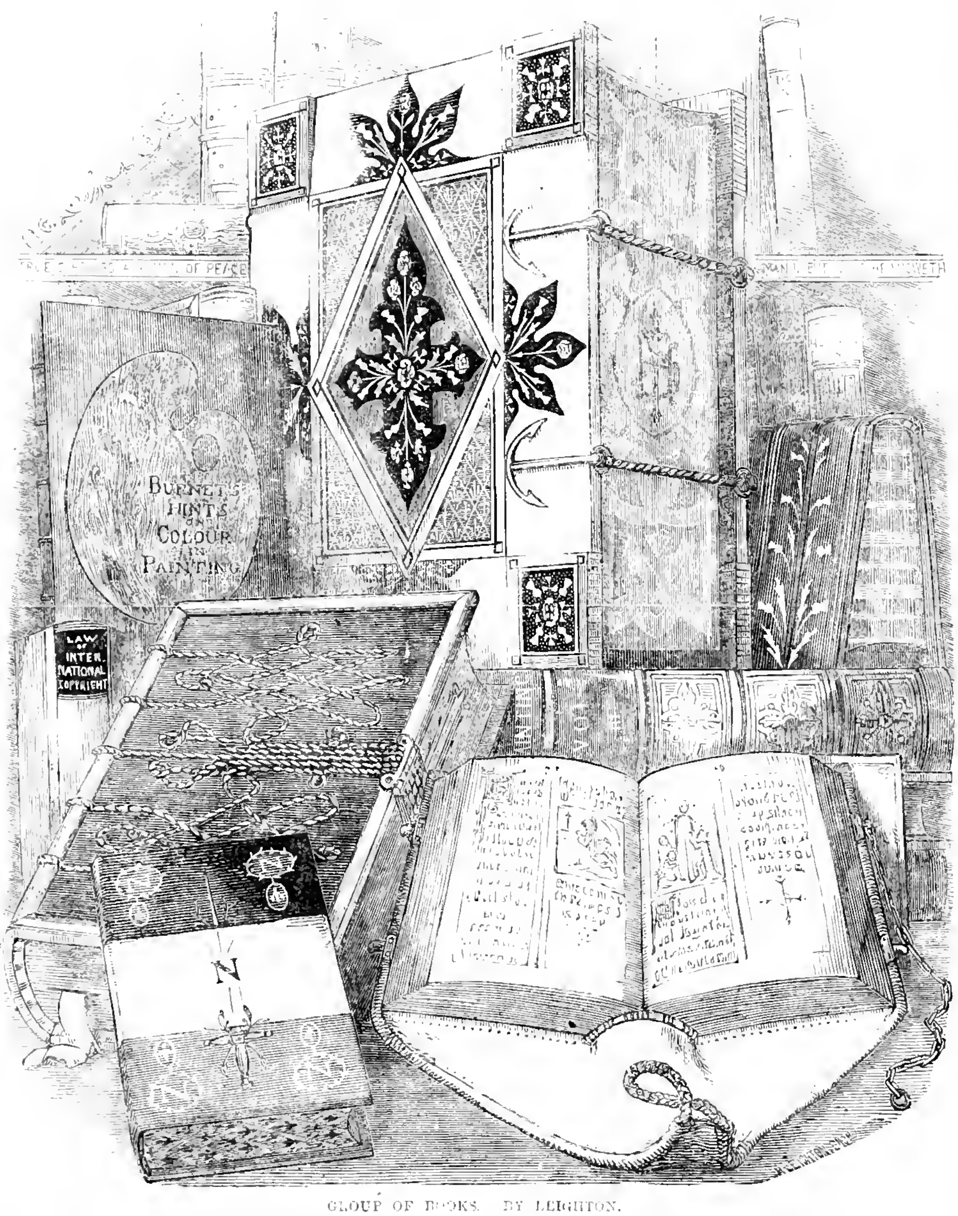
[TH]E silver dish by Mr. J. Angell is embellished with a subject designed [t]o [h]onour and commemorate the Great Industrial Exhibition — her [Maj]esty, as Britannia, receiving the contributions of the various nations of the earth; in the rim are a medallion containing profiles of the Queen and Prince Albert, and others allegorical of the four quarters of the globe. The design is by J. Henning, jun. It has a very pleasing effect.

BOOKBINDING.

THE various specimens of bookbinding exhibited both on the British and Foreign side, afforded evidence that an animated struggle is going on for pre-eminence in the ornamentation of the outer parts of books; and many ingenious and gaudy devices are the result. But upon the whole, we cannot approve of the taste which lavishes so much upon the externals of our literature: it is neither in harmony with the calm spirit of intelligence which should preside over the hours of study, nor, to speak upon decorative points, do we think that so much laboured and far-fetched vanity improves the appearance of the shelves of the library. Proceed we now to a few details.

BRITISH SIDE.

Remnant and Edmonds contributed a good selection of bindings, including Owen Jones's stamped leather covers, and a pleasing specimen or two of "classic" books in calf. Barritt and Co. next showed the wonders of their workshop. Their huge Bibles, with the sunk panels, gilt metal ornaments, and profuse embellishment, cannot please any one with good taste. Wright, of Noel Street, sent a copy of "Sylvestre," in morocco, very finely tooled; and "Das Niebelungen Lied," in white vellum, inlaid with lines of orange and purple leathers, making a tasteful pattern. Let us here, once for all, protest against the absurdity of decorating the edges of books with pictures. Macomie and Co. contributed a large Bible, bound in morocco, with a bronze ornament running round the side; another Bible, in buhl-work, and a "Boccacio," in white vellum, inlaid with colour. Mr. Macomie seems fond of the raised panels—a style we cannot admire. —— Evans, of Berwick Street, "the inventor of English illuminated binding," as he calls himself, filled a case with examples of this wonderful art, and of the "Victorian" style of binding. Here we had a copy of one of the book covers in the British Museum, very well executed in coloured leathers: the rest was mere "fancy stationer's work." Batten, of Clapham, had a case containing some richly-tooled bindings for the "Song of the Bell," "Moore's Melodies," and a "Shakspeare;" but Gothic church windows are not fit ornaments for the bookbinder's use, even on Bibles and Prayer-books. Orr and Co. showed books published and bound by them: some of them with good gilt ornaments. Josiah Westley had a case chiefly filled with publishers' bindings, that are certainly a great advance in style on the productions of even two years since. Binns and Goodwin, of Bath, showed one specimen elaborate enough, but not to be praised beyond the execution; and then we come to the large show made by Leighton, of Brewer Street. There was a great deal of pretence about this case, which we cannot say was particularly w carried out. In one compartment we noticed manuscript copies of c printing and old engravings marvellously executed, and there were so unostentatious examples of excellent binding; but who will admire t decorations of a Bible, which, because it is called "King William's Bibl has the clasps formed of cables and anchors "in honour of the Sai King!" Who cares to see "Burnet on colour," with a painter's palette the side—mind, not a conventional ornament, but the verisimilitude o palette, dabs of colour and all! Then there was "Rasselas," bound oriental stripes; but this is so richly and well done, that we will quarrel with "Bacon's works," hog-skin! Verni "Life of Napole bound in tri-colou morocco, the ed diapered with b ascending and *fle de-lis* reversed, " pifying the rise Napoleon and fall of the Bo bons;" and then, better taste, "Tho son's Seasons," w the twelve signs the Zodiac; "Horatius" "Macaulay's Lay in classically or mented calf.



GROUP OF BOOKS. BY LEIGHTON.

There were some books painting on the on sunk panel good enough as as the painting concerned, but i not a poor idea t to ornament a bi ing? But if Mes Leighton's conc are somewhat abs (their workman is excellent), w shall we say to Churton, who blessed with "a for ornament books by era or ject!" A work railways has is meant to b tunnel, elabora worked on the with gold lines. Pirate and Th Cutters is decora with cable orname and Shakspeare w an Elizabethan chitectural sc Surely these pu lities can hardly patrons.

Mrs. Lewis ha case of well-bo books — one on raldry, appropria enough ornamer with small coat arms at the corners; Cundall and Addy showed some examples of morocco bindings of Mr. Hayday (who unfortunately did not him exhibit), and an elaborate pierced metal cover, executed by Burtt Sons, for choice examples of art workmanship. The design of ornament—copied from an old Venetian binding of the 17th cent —is very beautiful. Leighton and Son next exhibited some el designs for bindings by Luke Limner; two Bibles very creditably bou and an elaborate cover for a small Bible in stamped gilt metal. of the best and most honest-looking bindings in the show was tributed by Mr. Tarrant, a copy of Sir Thomas Lawrence's Works orange-coloured morocco, richly gilt, and with a little inlaying of ot leathers. Clarke, of Frith Street, showed a variety of good, substan volumes, in the old "tree-marbled" calf, and regular library bindi —his green and purple stainings were more curious than admira Mr. Bridden and Mr. Wiseman, from Cambridge, each exhibited la Bibles, elaborate and creditable; and our Scotch friends sent us a Bi

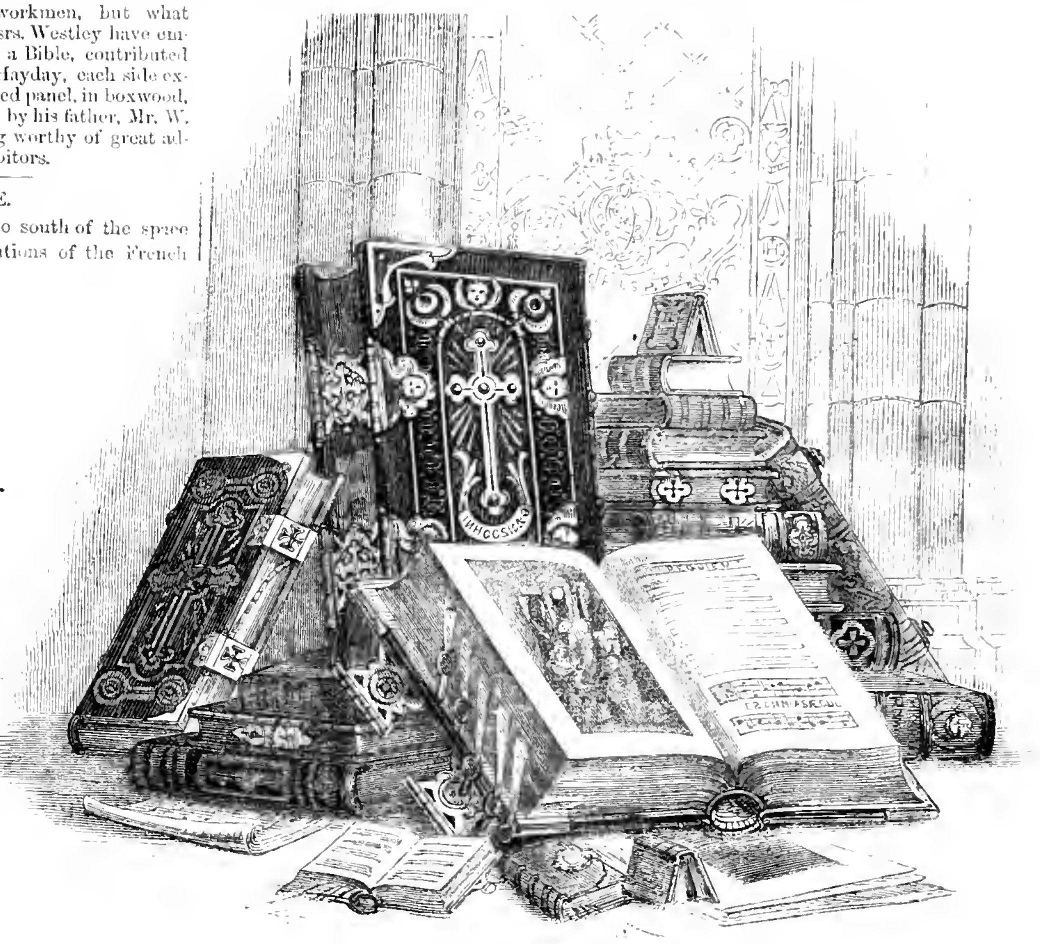
und in white morocco, inlaid with coloured roses, and ornamented in the ntre with a gilt fountain and flowers! From other specimens from the rth country we are only able to gather that good taste has not yet been roduced to the Scotch bookbinders. Mr. Parker, of Oxford, sent a case rdly commensurate with his reputation. Mr. Riviere, of Great Queen-eet, had, perhaps, the choicest collection of all. He contributed but ar books, and all are excellently well bound. Spenser's Works, in orocco, elegantly tooled with lines, somewhat in the Grolier style, among ich the letters V.R. are just traceable. A Common Prayer, in morocco, an old style; Virgil, in white vellum, rather too much inlaid with ours; and a good example of "tree-marbled" calf. Bone and Son had aso containing some of the best designs for cloth bindings, well carried t in all their detail. Westley and Co. had a large display; among some y good cloth and morocco examples, we found a huge Bible, ornamented the inside of the cover (which was shown to the spectator) with a Gothic arch window, elaborated with a profusion of detail, all ding to prove what excellent workmen, but what etched artists, in this instance, Messrs. Westley have em-yed. In the Fine Arts Court, was a Bible, contributed Messrs. Nisbet, but bound by Mr. Hayday, each side ex-sitely ornamented with a richly carved panel, in boxwood, igned by Harry Rogers, and carved by his father, Mr. W. Rogers. This was the only binding worthy of great ad-ation contributed by English exhibitors.

FOREIGN SIDE.

one of the divisions at the extreme south of the space otted to France were the contributions of the French okbinders. M. Gruel first ms our attention for his two o volumes bound in mo-co, inlaid with coloured hers, forming very bold and d designs; and for a missal velvet, richly ornamented h gilt metal and jewels; but mend us more to some ller books of "Hours," one carved ebony, one in velvet, ered with a tracery of ivory, ther in bright velvet, with eautiful design in carved -wood; and to two or three er volumes in Russia and et slightly ornamented with al hinges and clasps of ex-lingly graceful ecclesiastical gn, very different from the ormed and heavy Gothic erns to be found on our lish bibles. In the adjoin-case M. Niedrée exhibited perfection of workmanship elicate gilding. There were tiny volumes of this col-on that might challenge the ld for their superior. M. drée seems to prefer spend-his chief talent on the inside is covers; and on one of e little volumes especially there was the most exquisite design, most ably uted. For honest bookbinding, without the factitious aid of metal-work, ing or inlaying, M. Niedrée clearly, in our opinion, bears the palm; and a ed taste would, perhaps, be better pleased with this little show of volumes with all the glories of their more magnificent-looking brethren. imier sent a "Don Quixote" bound in light calf, with a good orna-tal design darkened upon it, and as a centre the celebrated wind-mill; a "Molière" decorated with a Grolier pattern: his other specimens not to be praised. Mame and Co., the great publishers, of Tours, bited a variety of cloth and morocco bindings, which we are sorry we ot commend: in general the ornamentation was gaudy and ill-designed. sian taste does not seem to extend much through the French provinces. the Northern Gallery, over the courts appropriated to Belgium, anicq, of Mechlin, exhibited a trophy, as it were, of Liturgies in various uages and all sizes, some of them illustrated and illuminated, and ly all bound in a showy way with stamped metal corners, clasps, and ments. The first impression promised something worthy of praise, we are sorry to find that a closer inspection dispelled the illusion.

the room in which MM. Leistler, of Vienna, displayed their beautiful cases, there were some marvellous examples of Austrian work.

ommencing at the left-hand side of the Gothic bookcase, we first ired a folio volume, bound in blue velvet, ornamented with silver tracery rich Gothic design. In the centre was a figure of Christ, and at the four corners was the symbol of the Evangelists—an angel, a lion, a bull and an eagle—all in silver. The next was an album, likewise in blue velvet, ornamented with gilt metal and tracery of ebony, tasteful in design; the centre was a bronze medallion, set round with a string of pearls. The third was a large volume in green morocco, inlaid with red and buff leather, ornamented with gilt metal work, enclosing ten medallions, painted like bas reliefs, in metal. Next came a large and beautiful book entitled "Landschaften," bound in purple velvet, exquisitely ornamented with pierced ivory of most elaborate pattern. Then there was a volume of "National Music," covered with metal-work and carved ivory. In the centre were the arms of Austria; and, surrounding them, fourteen little oil-paintings, mostly of rural costume, descriptive, we imagine, of the national songs. Next was a book in morocco, inlaid with ivory and a light blue enamel, beautifully ornamented with gold; and, behind it, a volume bound in tortoise-shell, with gilt and silver ornaments of Gothic design, and three female allegorical figures in metal. These books claim admiration for the elaborate and costly ornament upon them. They are—with the Gothic bookcase that holds them—a present from the Emperor of Austria to her Majesty. We have our doubts, however, as to whether all the credit is due to Vienna; more especially as some plain morocco books in the same case did not exhibit the same amount of taste or excellence of workmanship. Among the minor volumes we noticed a peculiarity not unpleasing; the titles of the books are lettered in raised metal letters, chased or burnished on the surface.



GROUP OF BOOKS.—HANICQ, OF MECHLIN.

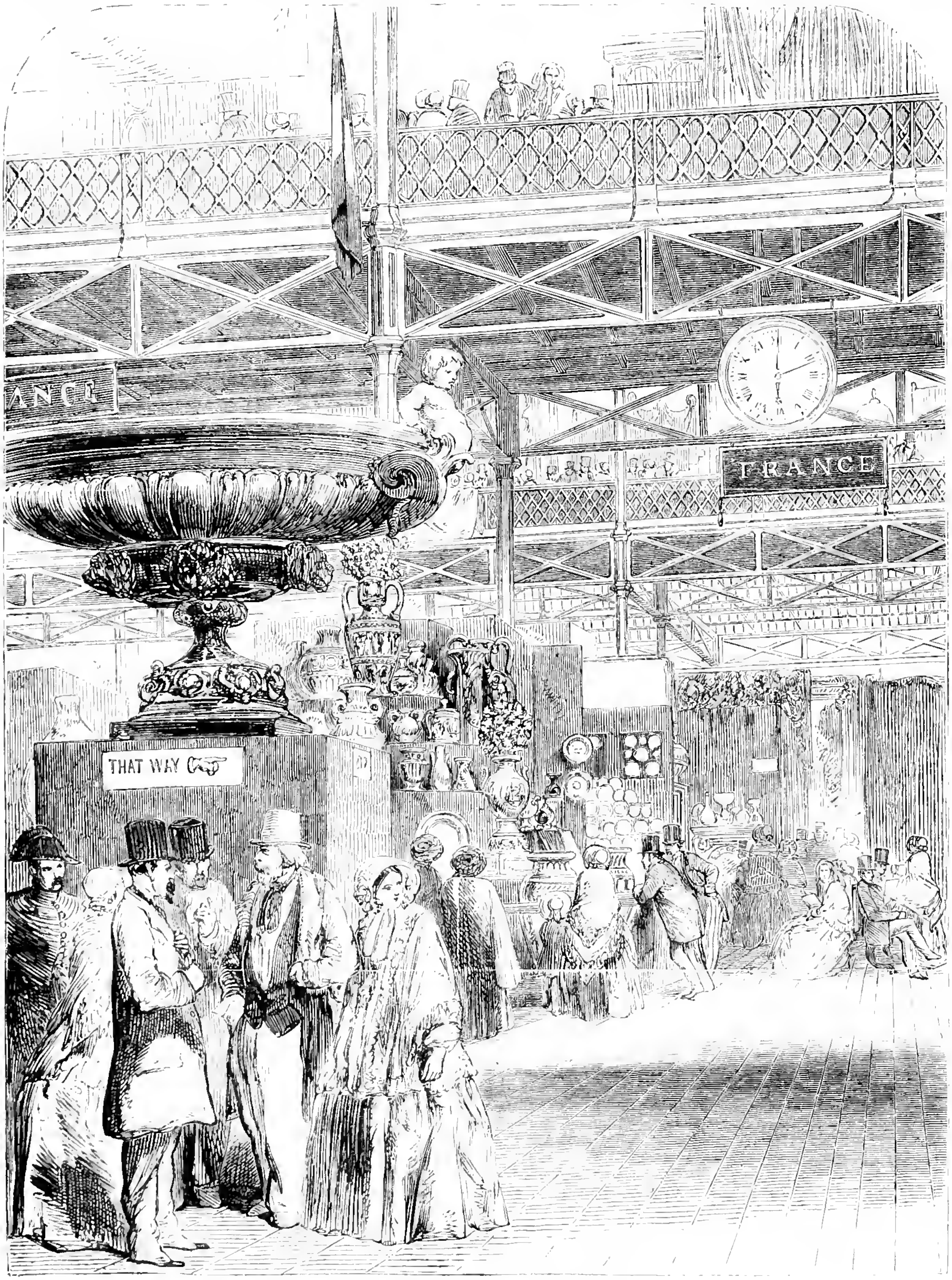
Waterlow's Autographic Press. By this apparatus, any person may with facility print any number of letters, circulars, pen-and-ink sketches, musical notations, &c.; the whole machinery being compassed in a neat box not larger than a lady's writing-case. The process is as follows:—A letter is written on prepared paper, and then transferred to a polished metallic plate by hand-power, assisted by a "scraper." The paper is then washed off with water, when the writing remains on the plate, and is charged with ink from a roller. Paper is now laid on the plate, and upon the application of pressure, the impression is derived, and the process may be repeated sixty or seventy times in the hour, the plate being subjected to the ink roller for each impression. When sufficient copies are cast off, the plate is cleaned, and ready for a fresh operation. The specimens worked are equal to lithography.

FOREIGN AND COLONIAL DEPARTMENTS.

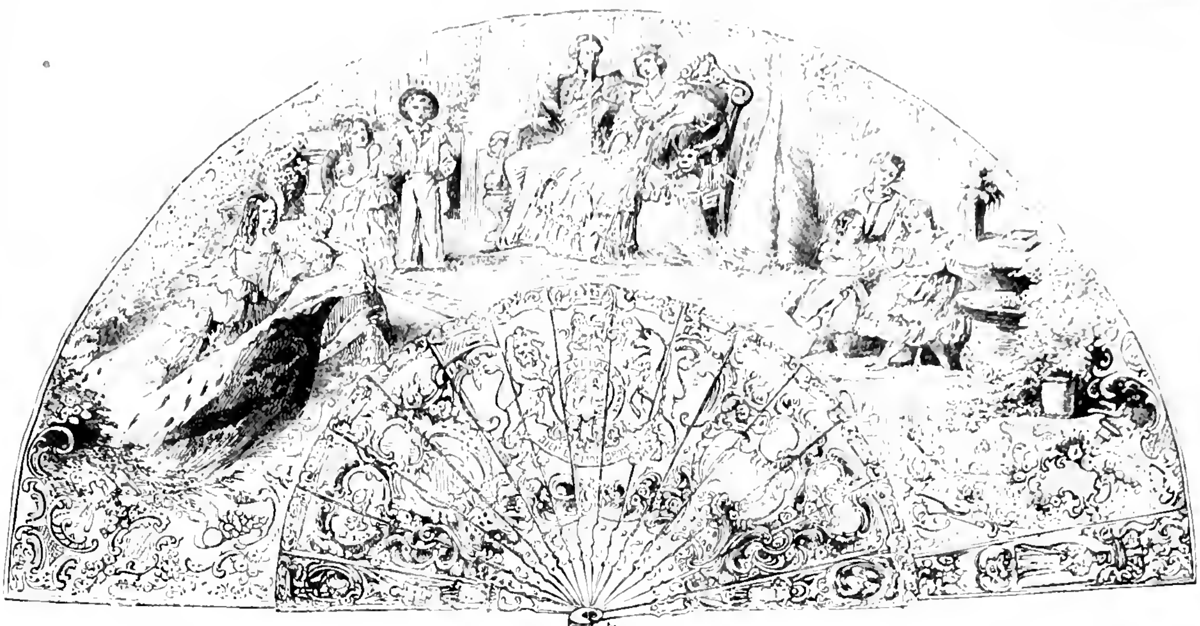
FRANCE.

A VARIETY of circumstances contributed to render the French collection, next to that of the United Kingdom, one of the most attractive and extensive in the Exhibition. The lengthened and successful experience enjoyed by France in exhibitions of national industry gave to the exhibitors an advantage not possessed by the majority of those contributing to t Exhibition, so far, that is to say, as concerned the arrangement and e cution of the minor details inseparable from a display of this descriptic The results of these national expositions of French industry, and th effect upon the industrial progress of the people, and the development art applied to the things of life, have been unquestionably great, a these were now presented to notice in a palpable form. No class the Exhibition, considered in its philosophical subdivision, was left represented by the French exhibitors. In raw materials, machine manufactures, a Fine Arts—the f grand sections i which the thi Classes resol themselves — sp mens of every v ety were exhibit The total numbe exhibitors amoun to about 1750, the area occup by their contribu articles was v large, both on north and so sides of the M Eastern Avenue, in the Galleries.

The principal tures only of large and valu collection will indicated in this troductory no Among the raw terials, the beau specimens of and thrown attracted unive admiration. Th a department o dustry which is stantly assur greater importa The samples of wound by modi tions of the cust ary processes of great beauty; an interesting s men of cocoon the frames in w the silkworms reared and pe ted to spin the derful envelop the pupa, gav good idea of manner in whicl culture of thes sects is carried The hemp, and other te materials exhit were likewise i esting. The cessful applic of philosophy manufacturing mistry for a c derable time has duced good re in this depart of industry. I universally ac ted fact that, some of the delicate che preparations, as vegetable loids, the pr tions of the Fr manufacturer those of other tions. The gr products were wise exhibited these, however,



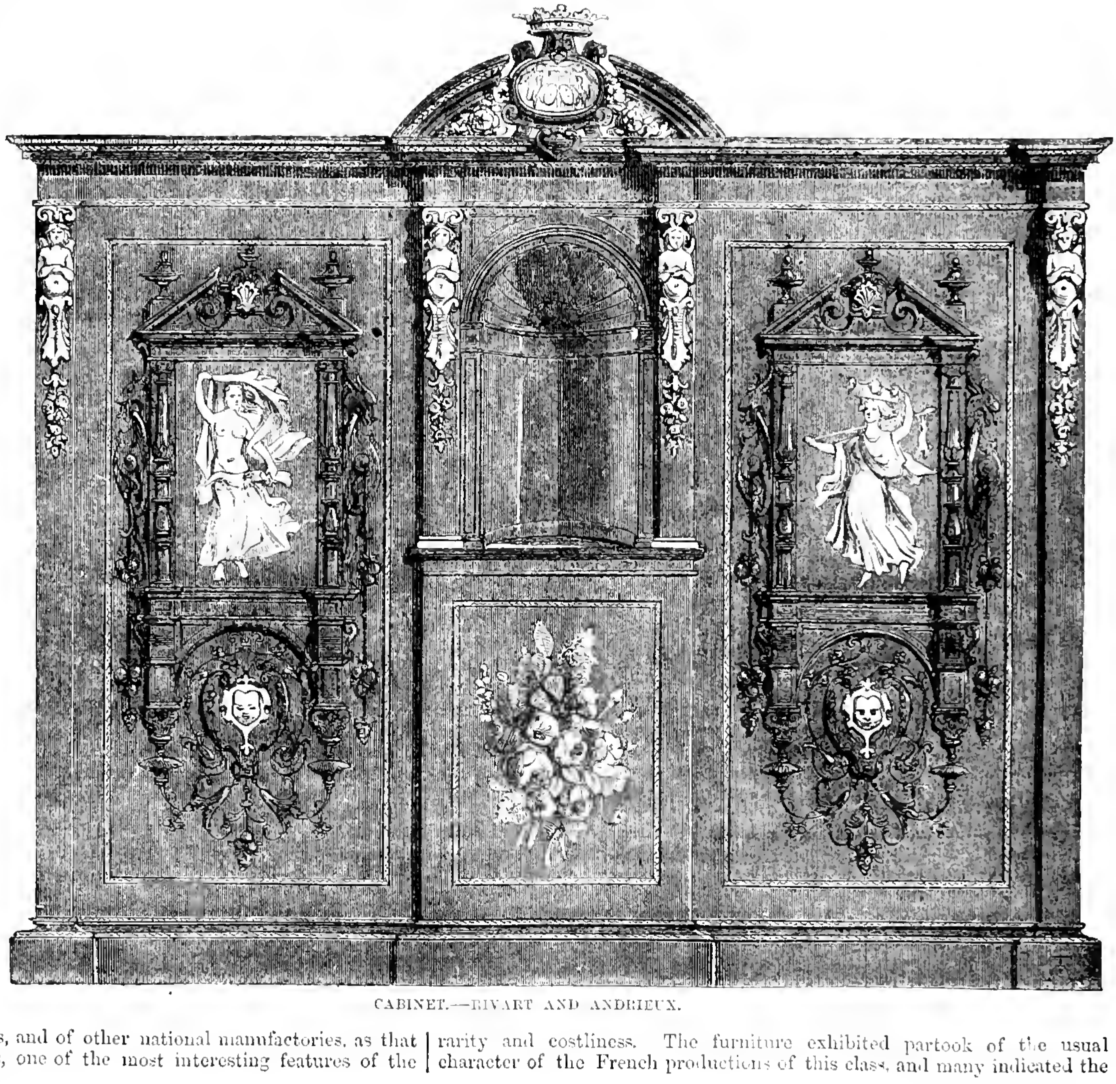
BAY O.—THE FRENCH DEPARTMENT.



THE ROYAL FAN.—DUVELLEROY.

ne success was t so manifest as similar produc- ns of British hibitors, proba- because the ter are gene- ly manufac- ed on a very ge and exten- e scale. The nents and vari- specimens of nts exhibited l each their cial value and rest. Speci- ns of metals of skill in tallic manipu- on were also wn,—in parti- ar, some large cimens of ten copper and ed brass, and cimens illus- ive of the iron nufactures. Ar- es of prepared l were also ely exhibited. fair collec- of machinery was likewise shown. It included, among many objects nterest, a large prime mover in the form of a turbine water-wheel, a hanical contrivance for development of power the descent of water, ecent introduction, and dy of extensive appli- on to the cotton and factories of France, to other mills. The er developed by the l in motion is very ht, and the arrangement he machine extremely pact and effective. mules for cotton-spin- , the carding engines cotton and wool, and endless paper-making hines, formed objects structive comparison the magnificent dis- of similar machines he British collection. kitchen apparatus, rs, and numerous r machines, were like- of an instructive cha- r. The philosophical uments and musical uments, inclusive of organ in the nave, ed also an interesting p of objects. Optical uments of different s were exhibited in perfection.

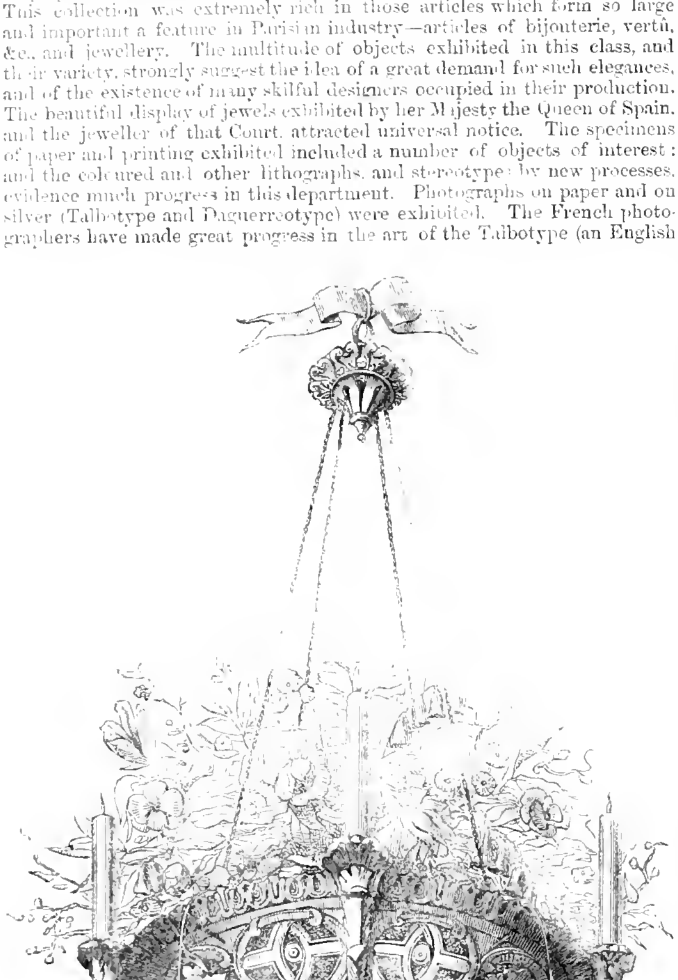
ong the manufactures in importance came gorgeous productions e silk-looms of Lyons, h were arranged in in the Gallery. The n manufactures, and of wool and linen, also interesting. The ns displayed admi- taste, and the skilful gement of many of articles added much eir attractiveness in xhibition. The splen- pestries of the Gobelins, and of other national manufactories, as that auvais, formed, perhaps, one of the most interesting features of the whole collection. They were accompanied by specimens of Sèvres porcelain, the articles in which, inclusive of vases, paintings, &c., were of great



CABINET.—RIVART AND ANDRIEUX.

rarity and costliness. The furniture exhibited partook of the usual character of the French productions of this class, and many indicated the

employment of talent of a high order in their design and execution. This collection was extremely rich in those articles which form so large and important a feature in Parisian industry—articles of bijouterie, vertù, &c., and jewellery. The multitude of objects exhibited in this class, and their variety, strongly suggest the idea of a great demand for such elegances, and of the existence of many skilful designers occupied in their production. The beautiful display of jewels exhibited by her Majesty the Queen of Spain, and the jeweller of that Court, attracted universal notice. The specimens of paper and printing exhibited included a number of objects of interest: and the coloured and other lithographs, and stereotypes by new processes, evidence much progress in this department. Photographs on paper and on silver (Talbotype and Daguerreotype) were exhibited. The French photographers have made great progress in the art of the Talbotype (an English



SUSPENSION.—VOISINLIEUX.

discovery), and beautiful pictures taken by modifications of that process were shown. Objects of sculpture and of the Fine Arts were likewise exhibited, and added to the interest of the collection.

The improvement in the manufacture of the commoner articles of life, which is now rapidly extending in France, may be in part attributable to the powerful encouragement to the production of this class of objects constantly offered at the National Expositions at Paris. The whole collection formed a fit illustration, and also an adequate one, of the present state of the industry of France.

Of all the foreign nations invited to the great celebration of the vast jubilee of industry of 1851, and who have shown by the extent of their preparations the interest which they felt in the success of that great undertaking, none occupied so high a position as France. But how little is known of her present position, either in a commercial or a manufacturing point of view, or of the progress which, as our most formidable rivals in many respects, the French have made of late years, both in commerce and manufactures! We propose to give, as part of our record of the Exhibition, a series of articles on the progress and present condition of French industry, which will be followed by others, relating to the representation of its special bran[ch] of industry, as indicated by the commodities sent for Exhibition.

STATISTICS OF THE INDUSTRY OF FRANCE.

Statistical science is of modern growth, and although on most subj[ects] connected therewith few countries offer the student ampler materials t[han] France, still, in questions relating to its industry and manufactures, g[reat] difficulty is experienced in obtaining accurate and authentic informa[tion]. In such matters, as well as in many others relating to the social econ[omy] of that country, the inquirer must be content to trace his researches [back] to the reign of Louis XIV.; for in those times originated almost all [the] civil and administrative institutions of France—and they, likewise, saw [the] dawn of correct information with respect to manufactures.

Colbert, having paid particular attention to manufacturing interests, [and] being anxious to ascertain the result of his exertions, decreed that a ge[neral] inventory of the manufactories in the kingdom should be made out. [It] turned out a failure, taken as a whole; but in some respects it was com[plete] enough to give an accurate notion of some particular branches of ind[ustry] —of the woollen trade, for instance, one of paramount importance at [that] time, since the cotton trade had not then been called into existence, [and] the silk manufacture was still in its infancy. The statistical returns obtained showed that the kingdom then possessed at least 34,200 loom[s for] the weaving of woollen stuffs of all kinds, inclusive of camlets, serges, [and] other inferior fabrics. The amount of materials produced was not less [than] 670,540 pieces, worth 19,978,291 *livres tournois*—equal to about 40 mil[lions] of francs currency. There were 60,440 artisans set to work thereby. [Each] loom wove 20 pieces of stuff annually, and produced 1200 francs wor[th of] fabrics; each piece being worth about 60 francs wholesale selling [price]. And if we suppose that, on an average, they measured ninety yards [each], it gave but 3 yards of woollen apparel to each inhabitant; a fact w[hich] proves that a great portion of the population, instead of wearing comfor[table] woollen clothing, was clad in coarse linen cloth and other inferior mat[erials] spun by the country people outside the factories.

But, on the other hand, it is curious to observe that there were 1[...] artisans in the lace trade—a fact, denoting what a considerable share lu[xury] and the taste for display had in the industrial pursuits of the sevent[eenth] century, at a time when the bulk of the people were in need of the n[eces]saries of life. It is at the same time only right to state that Colbert['s pa]tronage was bestowed upon the most useful arts and branches of ind[ustry], such as foundries, tin manufactories, glass, leather-dressing, &c., which [made] considerable progress. He brought over to France the brothers Vanr[obais], who founded at Abbeville the manufacture of Dutch cloths. Alrea[dy, in] 1648, had Nicholas Cadeau introduced at Sedan the weaving of [...] cloths, and in 1656 the looms in the hosiery trade had been imported [from] England by two merchants of Nismes. The importance of such in[stitu]tions had not escaped the observation of Colbert, who knew how to [...] and appreciate them.

From that time to the year 1788 no record is to be found of the con[dition] or progress of the commercial and industrial interests of the country. [In] that year, however, M. de Tolosan, then Intendent-General of the [Com]mercial Department, availed himself of his official position to carry ou[t the] original plan of Colbert. The result showed the industrial wealt[h of] France at that period, divided under three principal heads—mineral, [vege]table, and animal (with a small addition for arts and sundries)—t[hus], as follows:—

Mineral kingdom .	. 163,160,000 or 18	per cent. of the entire pro[duce]		
Vegetable kingdom .	. 316,500,000 or 34	do.	do.	
Animal kingdom .	. 451,800,000 or 48	do.	do.	
Total . . .	. f.931,460,000			
Add arts and sundries .	60,000,000			

It is not necessary here to dwell upon the several conclusions that [may] be drawn from this record of the industrial state of the country u[nder] Louis XVI., at a time when it had been favourably developed by peac[e and] by the administration of Turgot, Malesherbes, and Necker. We will [only] observe generally that such industries as borrow their raw material [from] the mineral kingdom were remarkably backward, and did not mee[t the] requirements of the population; while, on the contrary, those deriving [their] supplies from the animal creation had acquired considerable import[ance]. The woollen fabrics, in particular, had increased sixfold in value sinc[e the] time of Colbert. The value was, under Louis XIV., two francs per he[ad of] the population, while it was nearly ten francs under Louis XVI. [The] yield of the starch trade, which amounted annually to twenty-four mil[lions] of francs, proves how extensive was then the use of hair-powder, and s[hows] what influence fashion exercises upon certain branches of industry. [The] soap manufacture was far from having reached such a pitch of prosp[erity], and the produce was 33 per cent. inferior to the former article.

M. de Tolosan's returns comprise items which are well worth not[ice]. He endeavoured, in each of the chief branches of industry, to point ou[t the] share accruing to hand labour, in the shape of wages. The result [of his] inquiries showed:—

The total value of fabrics of all sorts to be . . .	f.585,000,000
Ditto of raw materials	259,650,000
Profits	51,500,000
Wages	266,850,000
Total of labour and profits	335,550,000

In the branch of hemp and flax manufactures, the raw material being home-grown, their value was low in proportion and, in the sum total of goods when made up, they claimed but a proportion of 25 per cent.; thus leaving three-fourths of their market value for labour and profit.

In the woollen department, the raw material being one half indigenous and one-half exotic, the price of the made goods was higher, and was equally divided between the price of the material and that of wages together with profits.

And thirdly, in the silk trade, the material, being all drawn from abroad,

ARM CHAIR.—JEANSELME.

claimed two-thirds in the total value of the article when manufactured, and left but 33 per cent. to be divided between wages and profits. It will be interesting to see hereafter how far those proportions have been maintained or changed.

Then came the great events of the Revolution. Before twenty years had elapsed, the industry of France, and France herself, had been completely transformed. A decree of the National Assembly, issued in 1791, had abolished trades unions and wardenships, and proclaimed the freedom of labour and industry. Freed from the shackles of the past, and incited by the necessities of the present, national industry made immense strides. For the arming, clothing, equipping, and maintenance of 14 armies and 400,000 National Guards, the country fabricated more iron, steel, bronze and textile wares than had been made since the time of the Valois. Unhappily no sure or complete data can be collected to give an idea of its state at that period, and we thus reach the year 1812, when Napoleon, following the idea of Colbert, resumed the statistical survey of industrial France—that is, of France as it was then, comprising its annexations. Thanks, however, to M. Chaptal, the celebrated Minister of the Interior, we are enabled to present the returns applicable to France proper, which show the following result:—

. Mineral kingdom	f.301,572,000	or	22	per cent.
. Vegetable kingdom	771,638,000	or	42	„
. Animal kingdom	508,385,000	or	28	„
. Sundries not otherwise denominated.	118,405,000	or	8	„
Total	f.1,820,000,000	or	100	„

Thus, in the space of twenty-four years—from 1788 to 1812—the industrial wealth of France had doubled, and had risen from 931 to 1820 millions. The consumption of manufactured goods, which at the former period was equal to 37 francs per head, had reached 63 francs in 1812. This was an increase of 70 per cent., even relatively to the considerable increase of the population. It may not be uninteresting to pursue the inquiry, and to state some of the changes which took place in the period between 1788 and 1812. The extraction of rock salt increased from 40 millions of kilogrammes to 150 millions. The requirements of war raised the annual casting of iron from 69 million kilogrammes to 112, or nearly double. Brass foundries trebled their products. The liberty of the press augmented fourfold the production of the paper trade; from 8 millions in 1788, it rose to 32 millions. The usages of progressive civilisation caused

THE GUARDIAN ANGEL.—VITTOZ.

the consumption of soap to increase from 18 to 33 millions. The production of textile fabrics, or the hemp, flax, and cotton manufactures, nearly doubled in value, and more than doubled in quantity, for prices were considerably reduced. Valued in the bulk at 225 millions of francs before the Revolution, they were set down at 435 in 1812.

On the other hand, the silk trade, which always suffered very greatly in disturbed times, could barely sustain its former state of prosperity in this instance. In 1788, it was set down at 107 millions of francs; while, towards the end of the Empire, it was 135 millions. Not so woollen fabrics. Their value, when compared at the two periods in question, differed not only by the increase in the quantity of manufactures, but by the fall in prices, by the introduction of machinery, by new processes of manufacturing and dyeing, and by the fabrication of a number of new descriptions of goods containing much less material within the same measurement. The rate of increase is shown in the following figures:—

	1788.		1812.
Number of looms	7,285	. .	17,074
Number of hands employed . . .	76,817	. .	131,409
Number of woollen pieces made . .	324,440	. .	1,240,977

Finally, not to carry details further, we will observe that an article almost unknown or despised before 1789—viz., coal—was brought into use as soon as the wars of the Revolution had set iron mines to work and had started numerous foundries. In 1794, the produce of coal mines was equal to two-and-a-half millions of metrical quintals—from 1813 to 1815 it had increased so that the average production for the three years was 8 200,000

quintals: it had more than trebled in the space of twenty years. We shall see elsewhere what it is in the present day.

VASE.—ODIOT.

The estimates of the industrial wealth of France in 1812, according to M. Chaptal, are thus recapitulated:—

Raw materials derived from agriculture	f.416,000,000
Exotic raw materials	186,000,000
Labour and wages	844,000,000
Sundry expenses, wear and tear of tools, repairing, interest, &c.	192,000,000
Profits	182,000,000
Total	f.1,820,000,000

This estimate was evidently under the mark, even for the period which it applied. And it did not comprise either the value of means conveyance or of motive power used for indust purposes—though these are too important ite to be overlooked.

The next estimates worthy of attention those of M. C. Dupin, in 1827, which embr Agriculture and commerce. They run thus—

Private industry	f.1,973,000,
Public works	659,000,
Conveyance, preparing, and retail sale of agricultural produce	420,000,
Profits on products of industry	281,000,
Profits from fisheries, shipping trade, &c.	362,000,
Interest on capital	370,000,
Wealth from industrial labour	f.3,325,000,

In the year 1844, we find the total numbe factories and other industrial establishments be 47,300, of a total rental of 34,372,681f., quiring an amount of raw material valued at less than 2,530,764,181f., which, when wroug is enhanced to 3,648,764,488f. These manu turing necessities employ annually 1,057,915 han among whom we find 672,446 men, 254,371 wom and 131,098 children, working each respectivel a salary of 2f. 9c., 1f. 3c., and 73c. per diem.

The return of machinery set in motion for purposes of the above is thus divided:—

Mills moved by water	22,
„ by wind	4,
„ by horse power	1,
Steam-engines	2,
Horses and mules	26,
Cattle	1,
Furnaces	9,
Forges	6,
Kilns	6,
Looms	305
Other contrivances	68
Spindles	5,008

If we compare the three periods just spoke —the latter of which, let it be remembered, not exhibit the whole production of France— find it in 1844 to be four times, even in its complete statement, what it was in 1788, and do what it was in 1812.

Again, examining each department separat we find the figures to be—

	1844. Millions of francs.		In 1812. Millions of francs.	In 17 Millior franc
Mineral products	628½	As compared with	391½	163
Vegetable do.	1955		771½	316½
Animal do.	1065		508	452

The comparison would seem to indicate that greatest improvement has taken place in the v table department, while the least advance has b in animal products—the yield being in the for case six times what it was in 1788, and ne treble what it was in 1812; while in the la the difference in respect of the total had dwinc from four times to twice what it was in 1788.

A further comparison of details in the ret itself will enable us to trace the progress m up to 1844 in individual branches of indus Thus, in the vegetable department, we notice following:—

Flax and Heavy Fabrics.—Value of go manufactured, 93,015,743f.; value of raw m rial, 57,967,226f.; wages and labour, 35,048,51 made in 4597 various establishments, by 51, hands.

Cotton Goods.—Value of the manufactures, 410,627,202f.; value of material, 257,355,905f.; value of wages and labour, 153,271,297f.; made 2360 establishments, by 242,428 hands.

Mixed Fabrics.—Value of goods, 101,201,762f.; value of raw mater 68,056,661f.; wages and labour, 33,145,101f.; made in 483 establishme by 45,958 hands, both men, women, and children.

Thus we see that the proportion between wages and the price of mate —so much in favour of the former in 1788—is totally different now, and in favour of the latter nearly 100 per cent.

The same results are observable in products of animal origin, and are ven more striking, thus: –

Woollen Goods.—Value of manufactures, 439,966,000f.; value of raw naterial, 314,436,000f.; wages and labour, 125,530,000f.; made up in 2021 stablishments, by 126,732 hands. There is great difference between this roportion now and what it was in 1788, while in silk goods it seems to ave rallied.

Silk Goods.—Value manufactured, 405,822,000f.; value of raw material, 33,218,000f.; wages and labour, 172,601,000f.; manufactured in 1051 stablishments, by 163,156 hands.

If we consider the foreign trade of France n the bulk, for the year 1787, the earliest t which any correct record may be traced –we find a successive decrease down to 815; and then a revival and a progressive ugmentation, which becomes in 1849 treble hat it was at the time of the Restoration. his may be seen from the following bstract, presented in round numbers:—

Years.	Imports.
1787	551,000,000
1792	929,000,000
1797	353,000,000
1800	323,000,000
1815	199,000,000
1820	363,000,000
1830	638,000,000
1840	1,052,000,000
1849	1,142,000,000

Years.	Exports.
1787	440,000,000
1792	802,000,000
1797	211,000,000
1800	272,000,000
1815	375,000,000
1820	455,000,000
1830	573,000,000
1840	1,011,000,000
1849	1,422,000,000

The preceding abstracts embrace the vhole traffic of the country, but for our resent inquiry it is necessary to take nore particularly into account what is alled the *commerce special*—that is, that art of the returns which includes the nportation merely of products *retained or consumption,* and the exportation of xclusively *native products and manufacures.* This will give a more precise idea f the state of the national industry and nanufactures, in so far as they are shown in he intercourse with foreign countries, and will be seen that the latter, in the eneral exchange and movement of comnodities, claim a proportion of some 70 to 5 per cent.

The comparative progress in "special ommerce" has been as follows:—

Years.	Imports.
1815	199,000,000
1820	335,000,000
1825	401,000,000
1835	520,000,000
1840	747,000,000
1845	856,000,000
1849	780,000,000

Years.	Exports.
1815	422,000,000
1820	502,000,000
1825	544,000,000
1835	577,000,000
1840	695,000,000
1845	848,000,000
1849	1,032,000,000

Thus the aggregate of the special commerce—which amounted in 1815 to 21 millions, and in 1820 to 878 millions—rose in 1825 to 954 millions, the early average being about 750 millions. From 1827 to 1836, and from 837 to 1846, the average was annually 1001 and 1489 millions; compared together, the averages of these two decennial periods give an excess of 49 per cent. to the latter over the former; and if we take the two extreme terms of the two periods together, the progress is marked by a difference of 851 millions being 921 millions in 1827, against 1772 million in 1846.

The separate accounts kept in the import returns of "materials for indus trial purposes," and in the export lists of "manufactured goods," assist the inquirer in noting the variations of trade and industry. This will be shown in the following table:—

EVE.—DE BAY.

	Imports.		Exports.	
	Materials for Manufactures.	Manufactured Articles.	Materials for Manufactures.	Manufactured Articles.
	Francs.	Francs.	Francs.	Francs.
1787	431,000,000	120,000,000	285,000,000	154,000,000
1789	514,000,000	63,000,000	283,000,000	157,000,000
1797	279,000,000	74,000,000	93,000,000	118,000,000
1800	281,000,000	42,000,000	128,000,000	143,000,000
1805	412,000,000	80,000,000	199,000,000	176,000,000
1810	296,000,000	40,000,000	160,000,000	205,000,000
1815	174,000,000	25,000,000	156,000,000	242,000,000
1820	330,000,000	33,000,000	163,000,000	292,000,000
1825	460,000,000	73,000,000	259,000,000	408,000,000

It appears then that the imports of materials for home manufactures

rose from 139,752,000 in 1815, to 269 millions in 1825; 378 millions in 1835, and 611 millions in 1845, having more than quadrupled in the space of thirty years. From more recent returns it appears that the yearly average has been, in the decennial period 1837-1846, 543 millions against 316 millions in the decennial period 1827-1836, showing an improvement of 72 per cent. In the same way, commodities of direct consumption reached 178 millions in the latter, against 128 millions in the former period, being an increase of 39 per cent. Lastly, in manufactured articles, 55 millions stood against 36 millions, being a difference of 53 per cent.

The total exports of national produce or manufactures were, in the decennial period 1826-1837, 521 millions; in the second period, 1837-1846, it had reached 713 millions, thus showing an augmentation of 37 per cent. Natural produce came in for 159 millions against 186 millions, thus showing an increase of 25 per cent.; while, on the other hand, the improvement in the sale of manufactured goods was 41 per cent., being 527 millions against 372 millions.

EVE.—BY DE BAY.

THE idea of this very masterly group, which was exhibited in the Gobelins room, is poetical and picturesque, and is ably carried out. The First Mother appears to be lost in a reverie as to the future destinies of her offspring, the principal incidents of which are foreshadowed to the spectator in the bas-relief sculpturings on the pedestal. All things considered, we should be inclined to pronounce this to be one of the finest works of sculpture in the Exhibition. Some have given it the fanciful title of the "First Cradle," or Nature's Cradle;" but as that does not do justice to the poetic mystery involved in the conception, we prefer the simpler title by which we have denoted it.

ROYAL FAN.—BY DUVELLEROY.

DUVELLEROY has made a *specialité* of fans, in the production of which he is perhaps without a rival. His fame extends not only over Europe, but has made its way to remote quarters of the globe. Even the Chinese, so famous for their fans, so unwilling to learn, and jealous of change, have copied his designs. It would be rather difficult to describe the truly gorgeous fan which this celebrated artist has made for the Emperor of Morocco. It is a fan of wonderful magnificence, and, to say nothing of the painting and general enrichment, the diamonds and the jewels alone have cost more than 1000*l.* He exhibited also a set of fans illustrating the stories of the "Arabian Nights," which have been made to order for the Sultan of Turkey. But our present business is with the *eventail royal*, the subject of our engraving on page 245. In this little work of art her Majesty and Prince Albert are represented sitting in the drawing-room at Buckingham Palace, surrounded by their Royal children, after a picture by Winterhalter. The handle is of mother-of-pearl, and the medallions in carved gold. In the centre of the handle are the Royal arms of England, carved in *alto riliero*, in the thickness of the mother-of-pearl: the lion and unicorn support the 'scutcheon; and the two mottoes, *Honi soit qui mal y pense*, and *Dieu et mon droit*, appear in letters of mother-of-pearl on a ground of gold. Each of the radiating branches is terminated by a Royal crown, and the two principal branches bear, chiselled in the mother-of-pearl and richly gilded, portraits of the Queen and her Royal Consort. We understand that M. Duvelleroy employs upwards of two thousand men. This is easily accounted for, when we state that he makes fans as low as a half-penny each, and that even these have, every one of them, to pass through the hands of fifteen workmen.

SUSPENSION.—BY VOISINLIEU.

THIS is a very pretty contrivance or suspended vase for flowers, &c., made in porcelain, of which M. Voisinlieu exhibited several very pleasing varieties.

THE GUARDIAN ANGEL.—BY VITTOZ.

CALLED in the orginal catalogue *la Fortune et le jeune enfant;* this was an extremely successful specimen of French bronze-work.

GRAND VASE. BY ODIOT.

THE vase for the centre of a table, exhibited by Odiot, is a stately production, in silver, partly bright, partly frosted. The devices on the frieze, vase, and cover are composed of attributes to the God of the Ocean—probably out of compliment to the Ocean, in whose territories the Great Exposition was held; at any rate, it would be very appropriate as a yacht or race cup, and one of the handsomest things that could be adopted for the purpose.

BOOK-CASE.—BY RIVART AND ANDRIEUX.

The use of porcelain as an inlay to ebony seems peculiar to this house; but the present book-case is not so happy a specimen of its use as the casket in front of it. It is, however, a very showy piece of furniture, in style belonging to a late *rénaissance* era, and appears to deserve the credit of being one of the best examples of French workmanship in the Exhibition.

FIRE-EXTINGUISHING CEILING. This automatic contrivance was exhibited by Mr. Bergin, for extinguishing fires in laundries and other parts of a building specially liable to such accidents. The inventor proposes to have a large tank, containing water, fixed at the top of the room; this tank to be perforated with holes, and to be fitted with a valve plug, like a shower bath; the plug to be held down by a string, to be fixed near the most combustible materials; in case of fire, the string would be burnt, the plug would rise, and a deluge of water would be showered down on the incipient fire.

MEMOIRS OF WORKING MEN.

JOSIAH WEDGWOOD.

THE name of JOSIAH WEDGWOOD deserves to be recorded in the long lis of English worthies. To many artists this may be a name but littl known; it therefore becomes the more necessary, in a work of this descrip tion, to state a few facts connected with the life of this extraordinary mai He was born on the 12th of July, 1730, at Burslem, in Staffordshire, wher his father carried on business as a potter. The limited opportunitie afforded him for acquiring education may be judged of by the statemei of his biographer; that at eleven years of age he worked in his eld brother's pottery as a "thrower." This occupation he was compelled t relinquish in consequence of an incurable lameness in his right leg, cause by the small pox. After a time he entered into partnership with a perso named Harrison, at Stoke; and during this period his talent for the pr duction of ornamental pottery first displayed itself. A dissolution partnership ensued, and, in connection with a person named Wheildo he manufactured knife-handles in imitation of agate and tortoise-she also imitative leaves, and similar articles. Wedgwood returned to Bursle and commenced the manufacture of a cream-coloured ware, call "Queen's" ware. He was, by Queen Charlotte, appointed her potter. H business greatly improving, he, in conjunction with Mr. Bentley, a man taste and scientific attainments, obtained the loan of specimens of sculptu vases, cameos, intaglios, medallions, and seals, suitable for imitation by tl processes Wedgwood had discovered.

His ingenious workmen, trained in his manufactory, produced the mo accurate and beautiful copies of vases from Herculaneum, lent by S William Hamilton.

About this time, 1763, the celebrated Barberini vase (in the Briti Museum, some time since broken by a lunatic, but now admirab restored), was offered for sale, and Wedgwood bid against the Duchess Portland: but on her promising to lend it to him to copy, he withdr from bidding, and the duchess became the purchaser, at the price eighteen hundred guineas. Wedgwood sold fifty copies of it at fi guineas each, but the cost of producing them exceeded the amount of t sum thus obtained. After numerous experiments upon various kinds clay and colouring substances, he succeeded in producing the m delicate cameos, medallions, and miniature pieces of sculpture in substance so hard as to resist all ordinary causes of destruction or inju Another important discovery made by him was that of painting on va and other similar articles, without the glossy appearance of ordina painting on porcelain or earthenware—an art practised by the anci Etruscans, but lost since the time of Pliny.

Amongst other artists employed by Wedgwood was Flaxman, w assisted him in producing those beautiful sculpturesque ornaments, wh he was the first in modern times to execute in pottery.

In 1771 he removed to a village which he erected near Newcastle-un Lyne, and characteristically called Etruria. Here his works becam point of attraction to all civilised Europe.

Not only did he encourage artists, but he created a great trade pottery, and by his taste and talent improved the national taste.

Wedgwood's success led to the establishment of improved potteries various parts of the continent of Europe, as well as in several places Great Britain and Ireland.

His exertions were not merely confined to his own manufactory, l were cheerfully given to the establishing of several useful measures. the 17th of July, 1766, he cut the first clod for the formation of the Tr and Mersey Canal, which, by the skill of Brindley, completed a naviga communication between the potteries of Staffordshire and the shores Devonshire, Dorsetshire, and Kent. Wedgwood was a Fellow of t Royal Society, and of the Society of Antiquaries, and had bestowed c siderable attention on the science of the action of light, with a view fixing the images produced by the camera: but neither he nor Humphry Davy, who also investigated the subject, were fortun enough to discover any method of retaining these images—a wonder step in chemistry applied to the Arts, which was reserved for Niep nearly half a century later.

After a successful and honourable career, by which Wedgwood amas an ample fortune, he died, at the age of sixty-five, on the 3rd of January, 17

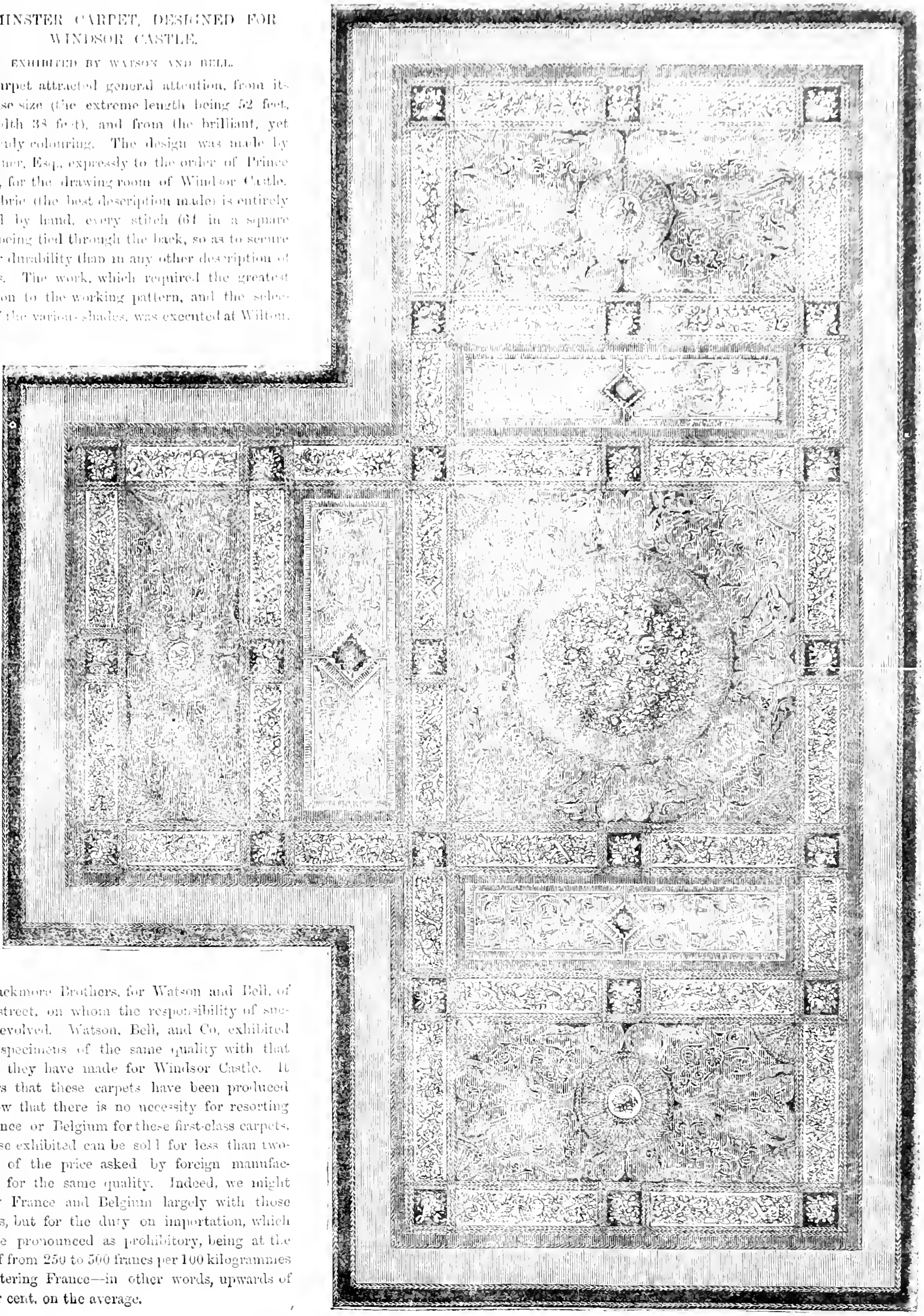
ALARM BEDSTEAD.—Mr. Savage, of Birmingham, exhibited a machine which, by means of a common alarum clock hung at the head of the b and adjusted to go off at the desired hour, the front legs of the bedste immediately the alarum ceases ringing, are made to fold underneath; the sleeper, without any jerk or the slightest personal danger, is placed the middle of the room; where, at the option of the possessor, a cold b can be placed. The expense of this bedstead is little, if any, more tl that of an ordinary one.

JUDKIN'S SEWING MACHINE—sews in a circle, curve, or straight line, stitches per minute; the rack in which the cloth is placed being mo forward by a spring, at a given distance for every stitch. There are t threads—one is carried in the shuttle, the other taken from a reel at top of the machine, and passed through the cloth by the needle; a when withdrawn, both threads are locked in a lasting stitch.

AXMINSTER CARPET, DESIGNED FOR WINDSOR CASTLE.

EXHIBITED BY WATSON AND BELL.

HIS carpet attracted general attention, from its mmense size (the extreme length being 52 feet, he width 38 feet), and from the brilliant, yet ot gaudy colouring. The design was made by . Gruner, Esq., expressly to the order of Prince lbert, for the drawing room of Windsor Castle. he fabric (the best description made) is entirely orked by hand, every stitch (64 in a square nch) being tied through the back, so as to secure reater durability than in any other description of arpets. The work, which required the greatest ttention to the working pattern, and the selecion of the various shades, was executed at Wilton,



y Blackmore Brothers, for Watson and Bell, of Bond-street, on whom the responsibility of sucess devolved. Watson, Bell, and Co, exhibited hree specimens of the same quality with that which they have made for Windsor Castle. It ppears that these carpets have been produced o show that there is no necessity for resorting o France or Belgium for these first-class carpets, s those exhibited can be sold for less than twohirds of the price asked by foreign manufacurers for the same quality. Indeed, we might upply France and Belgium largely with those rticles, but for the duty on importation, which nay be pronounced as prohibitory, being at the ate of from 250 to 500 francs per 100 kilogrammes n entering France—in other words, upwards of 0 per cent, on the average.

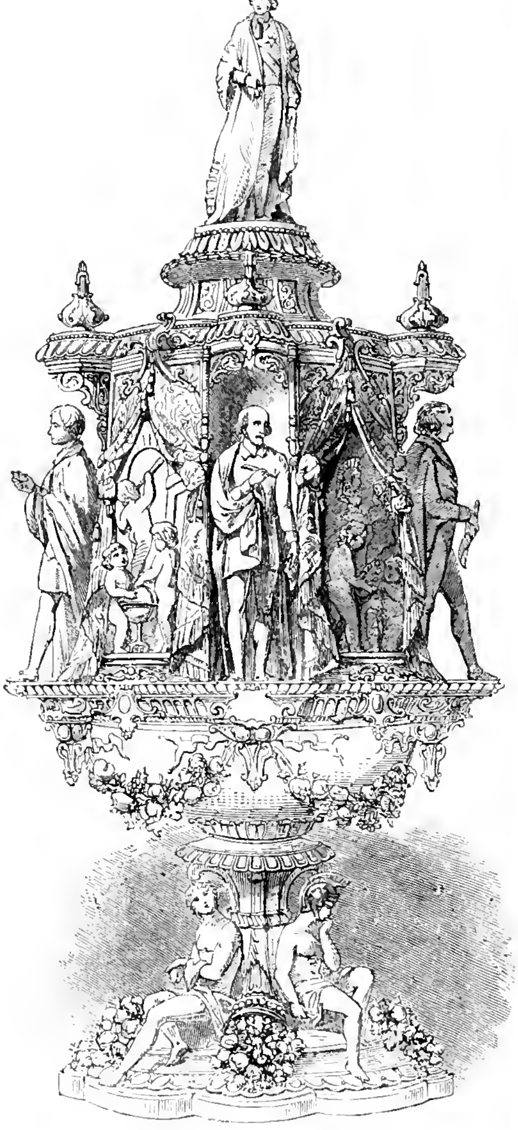
PLATE, AND PLATED GOODS.

WORKS IN ELECTRO-METALLURGY.

OF all the branches of industry represented at the Exhibition, there was probably none which excited feelings of greater interest in the man of science and the manufacturer, and certainly none which shows a more rapid and striking improvement, than that of electro-plating. Ten years have scarcely elapsed since small medals, coated by the aid of electricity, were and the favour bestowed upon them by all classes of the community, ar now sufficient to show that the public, always slow to appreciate nev inventions, have at length resolved to patronise the elegant productions o the manufacturers of electro-plated goods.

The electro-plate establishment of Messrs. Elkington and Mason, o Birmingham, is extending most rapidly, and though commenced withi the last few years, it already employs many hundred workpeople. It i divided into two branches—one for the manufacture of plated and gil articles generally, including the working of the patent processes, and th other for the more especial production of articles of the finer and mor

TABLE IN ELECTRO-SILVER.—ELKINGTONS.—THE PROPERTY OF HER MAJESTY.



VASE.—ELKINGTONS.

shown as curiosities; and its application to useful purposes was then considered by the many as more than doubtful. Fortunately, however, for science and the arts, Messrs. Elkington and Mason determined to show that, in the application of this subtle and mysterious fluid, lay hidden one of the most powerful agencies for the promotion and dissemination of a love of the fine arts, and for the multiplication of the comforts and luxuries of domestic life. Had they escaped the opposition of the interested and the prejudiced, their case would have been an extraordinary contrast to that treatment to which the originators or inventors of new principles and discoveries are generally subjected; so far, however, were they from enjoying this exemption from the usual fate of discoverers, that they received a heavier amount of vexation and harassment than has probably fallen to the lot of any other persons of a similar class. But the objections of manufacturers to the use of the apparently more difficult process of employing hard and white metal in the place of soft solder—the objections that the metal would peel off, that plain surfaces could not be produced, that raised edges and ornaments could not stand the wear, have now been most successfully removed. The great demand for articles of this kind,

recherché character, such as bronzes, &c. A third establishment is fa progressing towards completion, intended for the production by machine of forks and spoons, which will employ a vast number of hands, althoug the machinery is so perfect that several hundred dozens can be produce in one day. A piece of metal placed in one portion of the machine produced, at the other side, a finished article, of any ornamental shape c design that may be required.

By the application of electricity articles of solid metal may be produce as well as those having merely a deposit of metal upon the surfac required to be coated. One of the most remarkable instances of th successful production of solid silver articles by electric agency is th electrotype copy, in pure silver, of the celebrated cup of Benvenuto Cellin from the original in the British Museum. Of the works of this famou Florentine artist which remain at the present day, there are none whic show in a more remarkable manner his consummate art than this cup, an all attempts to reproduce it have hitherto signally failed. Those who hav had an opportunity of inspecting the original will be able to judge ho complete and successful was the copy exhibited by Messrs. Elkington

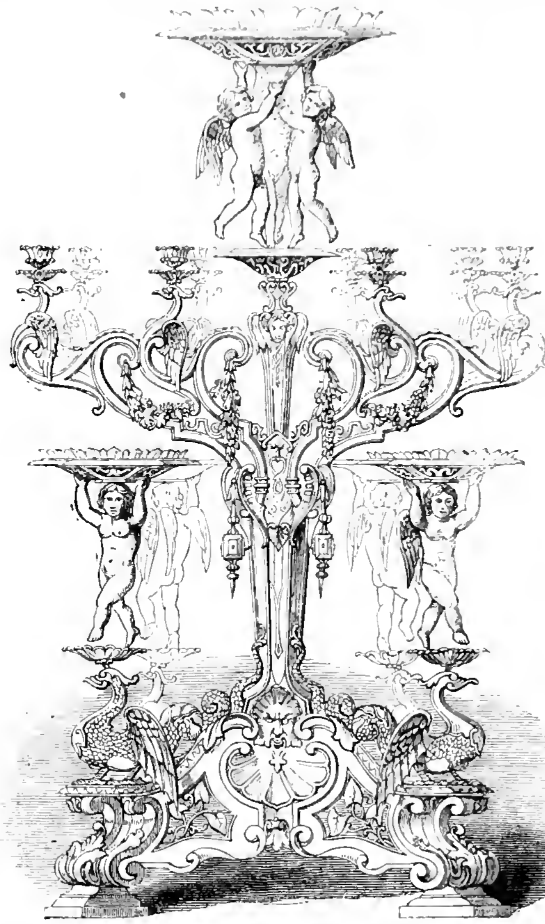
ile the price at which it could be produced in the inferior metals a most striking instance of the benefits which are likely to result m thus placing within the means of all classes articles which cannot fail produce a love of the fine arts. Another remarkable instance of the ccessful application of the process is the life-size figure of Geoffrey ndeville, Earl of Gloucester. In this case the metal was deposited in a uld, the interior of which was previously rendered conducting. The ocess of deposition of the metal is gradual in its character, and proceeds m a single point first made, until the whole surface is coated, and the gregation of particles proceeds until the desired thickness of deposit has en obtained. There were various other articles of this class exhibited, owing the application of the process to the production of solid metal.

EVE.—BELL. IN ELECTRO-BRONZE BY ELKINGTONS.

By far the more numerous of the articles exhibited, however, are those which a precipitation of one material or substance has taken place upon jects previously prepared for its reception. The whole of the electro-ted articles manufactured by Messrs. Elkington are produced from a tal which consists of an alloy of nickel, copper and zinc—the introduction which is one of the most important improvements in connection with the nufacture, as the alloy is of greater hardness, whilst its colour approaches ceedingly close to that of silver. When castings are required, the metal employed, as in the case of other metals, in a molten state, and is poured o moulds previously prepared for it: in large or complicated objects, h as the vase hereafter noticed, they are cast in separate parts, which afterwards joined by solder. The great improvements which have ently been made in the modes of casting metal enable the manufacturer produce articles of the most elaborate and ornamental character, as was emplified in many of the castings of iron, zinc, &c., in the Exhibition. here surfaces are required to be finished perfectly plain, the process of ing by stamping the required ornaments upon a sheet of metal previously inated is employed. In such cases the pattern or form required is graved upon hardened steel dies, which are placed under the hammer a stamp which moves between two perpendicular rods, and, falling with at force upon the sheet of metal placed under it, completes it in the form design engraved upon the die. Smooth surfaces are also obtained by the tal process of hammering. When the required surface has been obtained, s polished by means of brushing or grinding by steam power with emery, d, or rotten stone. The various parts, such as handles, borders, and amental cast work, &c., required to form the complete article, are united ether by hard solder, melted by means of the blow-pipe, and when finished by the chaser they are ready for the reception of the metal to be deposited.

The advantage which, at this period of the manufacture, the article possesses over other plated goods in the same stage, consists therefore in the use of a white metal—formed as above described, and of greater strength and hardness than silver itself—as a base, instead of copper, upon which the pure metal is deposited. The colour of the metal forming the base approximates closely to that of pure silver, and thereby avoids the unsightly appearance presented by the copper showing itself, after a short period of wear, in those plated articles where that metal is used as a base.

We have now taken the reader through the various preliminary processes of manufacture, to the stage when the article destined to receive the coating of pure metal is polished and completed in every respect. The next step



CENTRE PIECE.—ELKINGTONS.

is the electro-plating itself. It is an exceedingly interesting sight to witness, in the workshop of the artisan, the galvanic troughs and the magnets sending forth that subtle agent which in former times was known only in its uncontrolled power as it issued from the thunder-cloud; but which, traversing the slender wires, becomes in the hands of the workman a means of accomplishing his purpose as fully and as completely as any other tool or implement which he employs, and causing at his discretion a deposit of the gold and silver in the solutions to take place upon the articles requiring to be coated. Messrs. Elkington and Co. have employed in the manufacture of a large number of the articles which they exhibited—nearly the whole of which were made expressly for the Exhibition—a gigantic magnetic electrical machine, worked by a steam engine of five-horse power, a shock from which would annihilate a dozen men. This monster machine consists of a series of sixty-four permanent magnets, arranged in a circle in such a manner that an armature of wrought iron may revolve with great rapidity at a short distance from their poles, the current produced from which is conveyed by means of wires to different parts of the factory, in the same mode as gas in ordinary houses. The solutions of gold and silver are formed by dissolving an oxide or salt of the metal in cyanide of potassium; for electrotyping with copper a different solution is required. The articles which are required to be coated are attached by the operator to a wire, in connection with the positive or zinc plate of the electrical apparatus, and are immersed in the solution. A plate of silver, gold, or other metal required to be deposited is placed in the vessel which contains the solution—and, being connected with the negative or copper plate of the apparatus, is partially dissolved, and transferred to the article by the current of electricity which passes between them. A period, varying from five to ten hours, is required for a good coating of silver; gold, in consequence of a

less proportion being usually needed, being deposited with greater speed. Where it is required that the object should be only partially gilt or coated, the portions not requiring the deposit are covered with a varnish which effectually prevents its adhesion.

When the articles have received their coating of pure metal, deposited without the bright surface, they may be either burnished or polished. The polishing which spoons and forks and smooth plain articles of that nature undergo, is performed by an instrument formed either of blood stone or polished steel, of various shapes as required; the burnishing which all gilt articles receive is performed by rubbing the surface with a burnisher and soap and water. A large number of females are employed in this department.

The great advantages which the finished article produced by this process possesses are, that the union of the deposited surface with the base is so perfect and complete as to form, in fact, but one body. This is proved in a striking degree by the great pressure which the surface undergoes in the polishing, and by the fact that it will support a red heat without injury. To those who object to electro-plated goods on the ground that the surface is liable to peel off, such tests as these would, we should conceive, prove quite satisfactory. A second great advantage is, that the metal deposited on the more prominent parts of the article, and those which are more exposed to wear, is stronger than on those portions which are less exposed; thus giving to electro-plated goods a decided advantage over those plated by the ordinary mode. The articles exhibited also show that the most beautiful plain surfaces, as well as every description of style, however elaborate, and whether embossed or engraved, can be produced with equal facility and success. We would particularly refer to the Elizabethan tea-tray or salver in the Exhibition, as a fine specimen of the perfect, plain surface obtainable by the electro process.

Her Majesty exhibited two of the most beautiful productions of this class of goods: the one a bronze jewel case, gilt and silvered by the electrotype process. It was designed by Mr. L. Gruner, and manufactured by Messrs. Elkington. It is ornamented with portraits on china of her Majesty, Prince Albert, and the Prince of Wales—smaller medallions representing the portraits of the other royal children. The other royal exhibit was a very elegant small table of gold and silver plate, the top of which is a reproduction of a plate of fine workmanship, obtained and copied for Messrs. Elkington, under the direction of the Chevalier de Schlick. The subjects in bas relief represent Minerva, Astrologia, Geometrica, Arithmetica, Musica, and Rhetorica. The centre figure represents Temperance, surrounded by the four elements. The table was designed by George Stanton, a young artist in the employ of Messrs. Elkington, and a student in the Birmingham School of Design.

A vase exhibited in the collection of Messrs. Elkington as a *pièce d'occasion*, four feet in height, designed and modelled by William Beattie, is also eminently worthy of notice. It is thus described in their catalogue:

"A vase, intended to represent the triumph of science and the industrial arts in the present Exhibition. The style is rich Elizabethan. The four statuettes on the body of the vase are Sir Isaac Newton, Lord Bacon, Shakspeare, and Watt, representing astronomy, philosophy, poetry, and mechanics. On the four bas-reliefs, between the figures, the practical operations of science and art are displayed, and their influences, typified by the figures on the base, representing war, rebellion, hatred, and revenge, overthrown and chained. The recognition and the reward of these ennobling pursuits are symbolised by the figure of his Royal Highness Prince Albert, on the apex, who, as originator and patron of the Exhibition, is awarding the palm of honour to successful industry."

Several very fine specimens of electro bronzes were also shown, including the statue of the Earl of Gloucester; the Theseus; an historical group representing the Welsh Prince Tewdric, wounded, and urging on the pursuit of the flying Saxons, attended by his daughter and an aged bard, in the act of proclaiming victory. Also a fine specimen called "The Hours Clock Case," from a design by Bell, an engraving and description of which we gave in No. 6, p. 88.

Though we highly admire the process of manufacture we have been describing, we cannot always approve of the designs upon which it, any more than that of the more precious metals, is sometimes applied by the trade. There is need of a reform here, and the infusion of new ideas which genius alone can supply. Our last illustrated work, by Messrs. Elkington, is a large and showy centre piece for eight lights, in silver and electro-plate. The design is of a very ordinary character, by which we would imply no disparagement of the labours of the producers, but rather a reflection upon the tastes of purchasers, who "ordinarily" love to load the centres of their tables with as large and impervious a mass of plate as they can afford to purchase. To produce these structures, little boys are called into the service by dozens, without having time to dress themselves, and there they stand *in tiers*, with fruit baskets upon their heads, and shells or unkind rocks wounding their unprotected feet. One of the greatest evils of this style of table furniture is that it intercepts the view across the table, both sideways and lengthways—obstructs conversation; and not only that, but that interchange of smiles and intelligent regards in which half the charm of a social party consists. We should be glad to see these pompous displays—we might almost call them *pompes funèbres*—discarded, and something more rational, something quite as handsome, but less intrusive, supplied in their place. Indeed, we must add, that Messrs. Elkington themselves exhibited a dinner service, designed from the antique by the Chevalier de Schlich, which is perfectly to our taste. Here the centre-piece, which is of elegant design, does its duty as a piece of ornamental furniture, without obstructing the free circulation of air and thought in th midst of the table, and adds to the effect of a handsome banquet, witho monopolising all the attention to itself.

On a future occasion we shall notice the productions of other manufa turers and exhibitors of this class of goods.

TEXTILE MANUFACTURES.

WOOLLENS.—(British.)

IT would be no easy matter to overrate the importance of the admiral display made by the woollen manufacturers of the United Kingdom the Great Exhibition. In a department of our national industry whi may be said to be one of the ancient staples of the country, it was course expected that a good and satisfactory display would be made. B few, probably, expected such a result as we found here so unmistakeab produced, even from the finest broad cloth and doeskin down to t coarsest frieze and tweed: and whilst we hope to do justice to the mer of our Continental neighbours, we cannot but congratulate the Engli exhibitors in this department on their skill, judgment, and public spirit, taking care that a manufacture of so much importance was duly represente We have no hesitation in saying that the exposition thus made will more than a thousand "Wool Leagues" to place the cloth manufacture its true position—and that, too, without raising up a baneful and pernicio system of rivalry between two industries, which, after all, have essentia one interest. None but the veriest partisan could ever conceive ho cotton and wool were to be pitted against each other in the markets of t world, or how it was possible to forego the use of the one in order promote the exclusive prosperity of the other.

Looking at the question in an economic point of view, we find that t demand for the raw material of home-grown wool is greater than ev and that consequently prices are kept up in the market. The supp too, from our colonies is constantly on the increase; but then our mea of production by machinery increase also; and in proportion as producti is stimulated, prices come within the means of the masses, and the dema is again increased, to the greater consumption of that raw material whi but for this very machinery could not be used at all, but which is rais in price by the extra consumption consequent upon more economic mod of production. Thus the circuit of commerce embraces all interests, a does infinite service even to those who had fancied that they had interest in common with the spinner and the weaver; as if loom a plough were rivals, never to be reconciled—whilst the truth is th commercially, they are, when men direct them aright, the most cordial all allies, since their workers naturally consume the produce of each oth

The importance attached to the woollen manufacture of this country, a period far beyond existing records, is proved by the stringency w which its operations were formerly directed by guilds of merchant tail and wool staplers; and the earlier records on this subject give a m humiliating picture of the now exploded fallacies by which certain trad were attempted to be supported by the restrictive policy of legislato Happily all this has passed away, and in the broad daylight of the Crys Palace we had our oldest and our most recently introduced industries woollen and cotton—brought face to face; each excellent and useful in own way, and each employing its thousands of workers under an extend system, which has alone grown out of that freedom of thought and act which in modern times has been the characteristic of manufactur communities, in contradistinction to the selfish exclusiveness of by-go periods.

In connection with this department we must particularly notice t display of various specimens of wools as shorn from the fleece, exhibit by Mr. William Cheeseborough, in the Bradford compartment. Th examples were of the wools of the sheep of the various counties of t United Kingdom, and showed to great advantage the peculiarities of t raw material. The series of examples of the processes to which t material is subject, in its transition from the wool to the finished clo were admirably displayed in the contribution of Messrs. John Brooks a Sons, of Honley, placed in the Huddersfield division. In this series examples, the wool was placed before the visitor in the various forms assumes in the course of manufacture, commencing with an example fine Silesian wool, as shorn from the animal; next comes a specimen the same material scoured—and then as prepared for dyeing, or, as it called "woaded." The dyed wool comes next, and, following th specimens "willowed" and "scribbled." Carding, slubbing, spinning warp and weft, and an arrangement of warp yarn follow; and then con the cloth in its first state, as a fabric technically called "raw thread"—t oil which had been added after the dyeing, to restore artificially t natural oleaginous character of the fibre for the purposes of spinning a weaving, having been again taken out. Then follow specimens of the clo in various stages, from the "balk," or twilled cloth, through the "raise and "cropped" states—the series being completed by specimens of t same cloth "boiled," "tentered," and finished as fit for the market. A around the very handsome glass case in which this interesting series v displayed, were hung specimens of the cloths manufactured by Messrs. Jo Brooks and Sons, the exhibitors; in which the results of the proces shown were fully exemplified in the excellence of the texture, dye, a finish.

In the department to which our attention is now to be directed we h

full and complete illustration of the present position of the woollen anufacture, as evidenced in the productions of the two great localities in hich it is now carried on – the West of England and the West Riding of orkshire. Each of these districts comes before us as the exponent of ose branches of the woollen trade to which its manufacturers more pecially direct their attention; and whilst the superfine broad-cloths of e West of England illustrate, in a marked degree, the beautiful character the products of that locality, as adapted to the wants of the more ealthy classes of society, the miscellaneous but equally meritorious oductions of the West Riding show how largely that district is engaged supplying the wants of a great mass of the people, not only of this untry, but of those foreign nations and British colonies which have not t even attempted to manufacture this class of goods for themselves.

The manufacturing district known as the West of England comprises ree counties—Gloucester, Somerset, and Wilts; and the various towns or lages in which the manufacture of woollen cloth is carried on are scattered er a considerable tract of country. The system is altogether different om that of the manufacturing districts of the north, and the rural aracter of the localities of the respective seats of manufacture is not stroyed by the concentration of masses of workpeople, the erection of go factories with tall chimneys, and the roaring of steam-engines. Yet ere is a considerable division of labour, so to speak, for we find certain alities noted for the production of particular classes of goods. Thus owbridge produces trowserings, and narrow goods. Frome is chiefly gaged in medleys and coloured woollens. In Dorchester and its neigh-urhood kersey cloths and drab coatings are manufactured, whilst Tiverton, ippenham, Melksham, and Stroud, each produce the finest woollen cloths. e former sends forth the finest beavers made in England, whilst the ter produces the finest and best-made black, blue, and scarlet cloths.

Amongst the exhibitors from this quarter especially deserving honourable ention, were Mr. Helme, of Stroud, (whose kerseymeres and doeskins were exquisite quality and brilliant dye, and who was the successful competitor a gold medal, offered by Messrs. Bull and Wilson, for the best specimen black cloth, no restriction being made as to price); Messrs. Marling and ., of Stroud; Messrs. Playne, of Nailworth; Mr. Partridge, of Banbridge; r. Palling, of Painswick; Messrs. Philips and Smith, of Melksham; r. Overbury, of Wootton-under-Edge; Messrs. Carr, of Tiverton; Messrs. ter and Co., of Trowbridge; Messrs. Stanton and Son, of Dorchester; . W. S. Wheeler of Bath, and of Ludgate-hill; Mr. T. Sampson showed an ortment of shawls and glove cloths, manufactured from the wool of the pa Vicugna—a material which seems rapidly coming into use for the finer ality of articles, as used by ladies.

The West Riding of Yorkshire brought forth its best examples on this casion, and in many instances no effort had been spared to render the ntributions worthy of the intelligence, the industry, and the mechanical genuity of probably the most thriving community in the world. The eds exhibition of woollen cloths was one of which the inhabitants of that wn have a right to be proud; and though we are quite aware that, in many instances, the cheap cloths of Yorkshire deserve all the odium ich has been from time to time cast upon them, yet here we found it inly demonstrated that the fault really lies with foolish buyers of low ced, and consequently badly made goods; and we trust that one of the sults of this Exhibition will be to prove that the cheapest article is that which the quality is commensurate with the requirements of wear, and t some articles are dear at any price.

Messrs. Benjamin Gott and Sons had a handsome glass case in the great enue, containing a remarkable display of the various qualities of woollen ths which they supply to the various markets of the world. These goods re brilliant in dye and excellent in finish, and, as examples of a class of ods made for the supply of large and distant markets, cannot be surpassed. e general manufacture of the Leeds district was well illustrated by the ntributions of Messrs. Sykes and Son. These consisted of a variety of ths in the usual colours, and were intended as a complete representation the class of goods usually supplied by the Yorkshire manufacturers; for ilst the West of England trade may be said to represent the require-ents of the wealthy classes, that of Yorkshire has for its object the supply the great mass of the community, at such prices and in such quantities the daily increasing demands require.

In pilots, tweeds, and Spanish stripes, the Houses of Messrs. Hague, ok, and Wormald, and Messrs. Yewdall and Son, exhibited the latter icles; whilst Messrs. York and Sheepshanks, Messrs. Pawson, and other ibitors, displayed some of the finest examples of the former classes, and o of cloths of the best qualities made in Yorkshire.

In mohair cloths, and camel's hair qualities of goods, now so much in hion for outer garments, the display was a good one; and Messrs. Gill d Bishop, and Messrs. Edwin Frith and Son, showed the value of these autiful materials in a most satisfactory manner. In blankets and carriage gs there was also a very superior display, whilst billiard cloths and a at variety of felted fabrics were shown by Mr. Fenton and Messrs. Wil-son and Co.

Nor was the display from Huddersfield less satisfactory than that from eds. We have already spoken of the character of the cloths exhibited Messrs. John Brooks and Sons, in connection with their illustration of e processes of the woollen cloth manufacture. The specimens of trou-ings exhibited by Messrs. Hinchcliffe were worthy of attention, as also re those of Messrs. Isaac Bearnsell and Co. The corded trouserings of ssrs. Lockwood and Keighley, and those of Messrs. Barnicot and Hurst, which colonial wool has been largely used, instead of the Saxony wool generally imported for that purpose, were all very good. In top coatings the mohair and Vicugna materials played a very considerable part. Messrs. J. and T. C. Wrigley and Co. made an admirable display of goods of this class from the Canadian and Russian markets, in which cloths of great weight, strength, and substance were shown. Messrs. David Shaw, Son, and Co. also exhibited some excellent examples of a peculiar mixture, which had an excellent effect, by the irregularity of tint which is given to the grain, and by a velvet like surface obtained in finishing.

The other portions of the British woollens were of a very miscellaneous, and generally of a very excellent character. Tweeds were exhibited in great variety by the manufacturers of Galashiels, and in both coarse and fine qualities they were generally very excellent.

The manufacturers of Kendal also made a very creditable display of the coarser kind of fabrics manufactured in Westmoreland. Messrs. Ireland and Co. exhibited a very extensive assortment of those indispensable requisites to the traveller – railway rugs. These are made of Alpaca wool, as also ponchos and coatings. Horse blankets and horse clothing were also comprised in this contribution. Kendal, as an early seat of the woollen trade of the north, has done its duty on this occasion, to the satisfaction, and we trust the profit, of those who have exerted themselves.

In horse clothing and blanketings there were the old repeated produc-tions of Chipping Norton and Witney. The kersey checks for horse clothing, railway wrappers, and alpavicugna beaver for ladies' cloakings, were all excellent for manufacture and finish. The blankets of Messrs. John Early and Co. were of the usual character of Witney blankets—good, substantial and clear in colour; but Mr. Edward Early made an effort to do something more, and exhibited a series of blankets manufactured from the wools grown in various counties in England.

In flannels, the grey and dyed specimens of Messrs. Kelsall and Bartle-more, of Rochdale, displayed great excellence. Mr. Bamford, of Rochdale, also exhibited fine gauze flannel; and Messrs. Smith and Sons, of Saddle-worth, showed specimens of fine and superfine flannels with silk warp. These examples were all of a highly creditable character. The Welsh flannels exhibited by Messrs. Lloyd and Co., of Newtown, Montgomery-shire, were also of a superior quality. The Welsh productions are generally, of course, of a primitive character, and illustrate the employment of the peasantry rather than the state of a manufacture. In this respect there is a strong analogy between the productions of the Principality and those of Ireland, as far as the woollen trade is concerned. The division devoted to Dublin showed examples of the woollen manufactures of Ireland, from the coarsest productions in Connaught frieze up to the finest examples which the present state of this trade in that country permits it to produce. In the higher or better class of goods, Mr. Dillon, Messrs. Williams, and Mr. Richard Allen—all of Dublin—made a very satisfactory display. The trouserings were firm and well-made articles, excellent in colour, but deficient in finish. The friezes made by Catherine Neill and Sons, of Tallaght, and exhibited by Mr. Allen, were good examples of a rough material; but the economics of Irish manufacture were best illustrated by the contri-butions of Widow Murphy, of Ballysmutton, county Wicklow—who grows, shears, dresses, spins, dyes, and prepares in every way the material, to be afterwards woven and finished in her own homestead. The friezes and blankets exhibited by Mr. Nicolls, of Cork, were also worthy of notice, as showing the growing disposition for industrial pursuits in the south of Ireland.

POWELL'S BISUNIQUE OR REVERSIBLE CLOTHS.

ONE of the most remarkable novelties in textile manufactures exhibited was Powell's Bisunique or Reversible Cloths, of which we now proceed to give some account. We must premise that in all the vast improve-ments which have been made in the machines used for the manu-facture of woven fabrics, from the first preparation of the raw material to its ultimate finish after it has passed from the loom, there is not a single important deviation from the simple principles of the rudest process of which we have any traces from antiquity. Whilst this may be said truly, even of the most complicated and beautiful machinery which the ingenuity of this country, more than any other, has introduced into the various operations which the fleece, the fibre, or the down, must undergo before it reaches the hands of the weaver, at the same time the truth of the paradox is most complete and remarkable in the case of the loom itself. In carding, combing, spinning, throwing, and warping, the beautiful, in some instances the wonderful, contrivances by which British invention especially has superseded the labour of man's hand, and to some extent the working of his mind, are in reality but improved modes of applying old principles, or modifications of the primitive handicraft. But they effect, however (by means almost identical), vastly increased rapidity, vastly multiplied quantity, and most varied quality. The card, the spindle, the bobbin, and the reel, are practically the same as ever, but the various and intricate sub-stitutes by which they are put in motion give a totally new character to the operations, and in some degree may be considered as introducing almost new principles even in the primary processes.

The same cannot be said of weaving. The stupendous machinery of the cotton-mill may disown all obligation to the wheel and spindle, or the simpler distaff; but in every essential except the motive power, and certain accessories for speed and fashion, the newest of our power looms has every essential principle in common with the plain hand-loom, or the simple appa-ratus which the tenacious Hindoo keeps unaltered from the remotest age of civilisation. All the working parts are the same, with little modi-

fications. The beams, the treddles, shuttle, lay, and batten, are much alike in both. That the manufacture of every kind of woven fabric has been advanced in all respects to a prodigious extent in the British islands, within the four hundred years that have elapsed since the first settlement of Flemish weavers was fixed by the favour of Edward III. (in the busy and far-famed West-Riding), and that much of the wealth, greatness, and even the peace which we now happily enjoy, is owing to that advance, created in part by improved methods of weaving, are of the proudest boasts of our age and country. The great variety of new fabrics which have been of late and are daily produced, especially in worsted and mixed cloths—such as merinos, paramattas, orleans, and the like—are rather the results of improvements on previous processes than in weaving itself. Scarcely any alteration can be said to have taken place in the process so as to affect the nature of the product itself.

But we have now before us what appears to be a great departure from the ancient mode of weaving: it is that recently introduced and patented by Mr. Samuel Powell, of Loughborough, Leicestershire, and London. The only essential improvements on the primitive mode of weaving until this time may be stated to be the fly-shuttle, the Jacquard-loom, and the practical application of water and steam power, as substitutes for the hands and feet of man. But the novelty to which we allude consists in the manufacture of a variety of fabrics, which Mr. Powell has chosen to designate by the name of "bisunique," or two-fold, each side of the cloth or fabric having two faces of different colours or pattern perfectly finished, and capable of exhibiting any variety of pattern or design, as a single fabric.

Four examples may be noticed as shewing the application of the new mode of weaving patented by Mr. Powell :—

1st. To produce a cloth in which both sides are of one make or pattern (either side showing a different colour from the other, or both sides of the same colour and finish), the whole of the warp threads are divided into two equal parts, each of a different colour. They are then put into the loom alternately: that is, a single thread of one colour and then a single thread of the second colour, and so throughout, the twist of the one being open band, and the

twist of the other cross band. The warp is flushed on b sides, four picks and each coloured warp is bound in made fast by the same shoot of weft passing through t middle of the warp, there being as many threads above t weft as below it.

2nd. To produce a cloth in which one side shews two more colours, while the other side is of one colour only is necessary that one-half the warp threads should be of t requisite proportions, say of red, green, and brown, a the other half of the one colour only. The colou threads are placed in the loom either alternately and equal numbers, or in such order and numbers as t intended pattern requires, while the other half of the w will be seen only.

3rd. To produce a cloth of which one side is to be o different quality from that of the other—say, one side fine drab and the other of black, brown, or blue—one-h of the warp threads are of a fine and the other half o coarse wool.

4th. All the different arrangements of the 1st, 2nd, a 3rd, may be combined in one piece, and in this combin arrangement a greater or less number of warp threads used to form one side than the other, also the threads the warp on one side may be made of two or more differe colours of thread and twisted together, while the threads warp forming the other side are all of one colour; when preferred, both sides may be made of twisted threa of different colours.

Experience only can determine the utility and applicati of these fabrics, and any advantages they may possess. is obvious they will lessen the difficulties of supplying sufficient variety of patterns in remote settlements in t interior of Asia and America, &c. By this invention single piece of any fabric, woollen, silk, cotton, or mixe serves the purpose of two, as far as regards choice colour, pattern, or quality, while at the same time t whole bulk to be carried inland is reduced to one-half wh would be generally required. Nor are these the only advantages whi they possess, for our traders at home will be enabled to keep double t amount of patterns in the same space which is now required for the ordinary stock, or the same variety of stock which they now keep will b obtainable at little more than half its present cost; and thus the amou of each trader's capital will in effect be greatly increased.

HORSE GROUPS IN THE RUSSIAN DEPARTMENT.

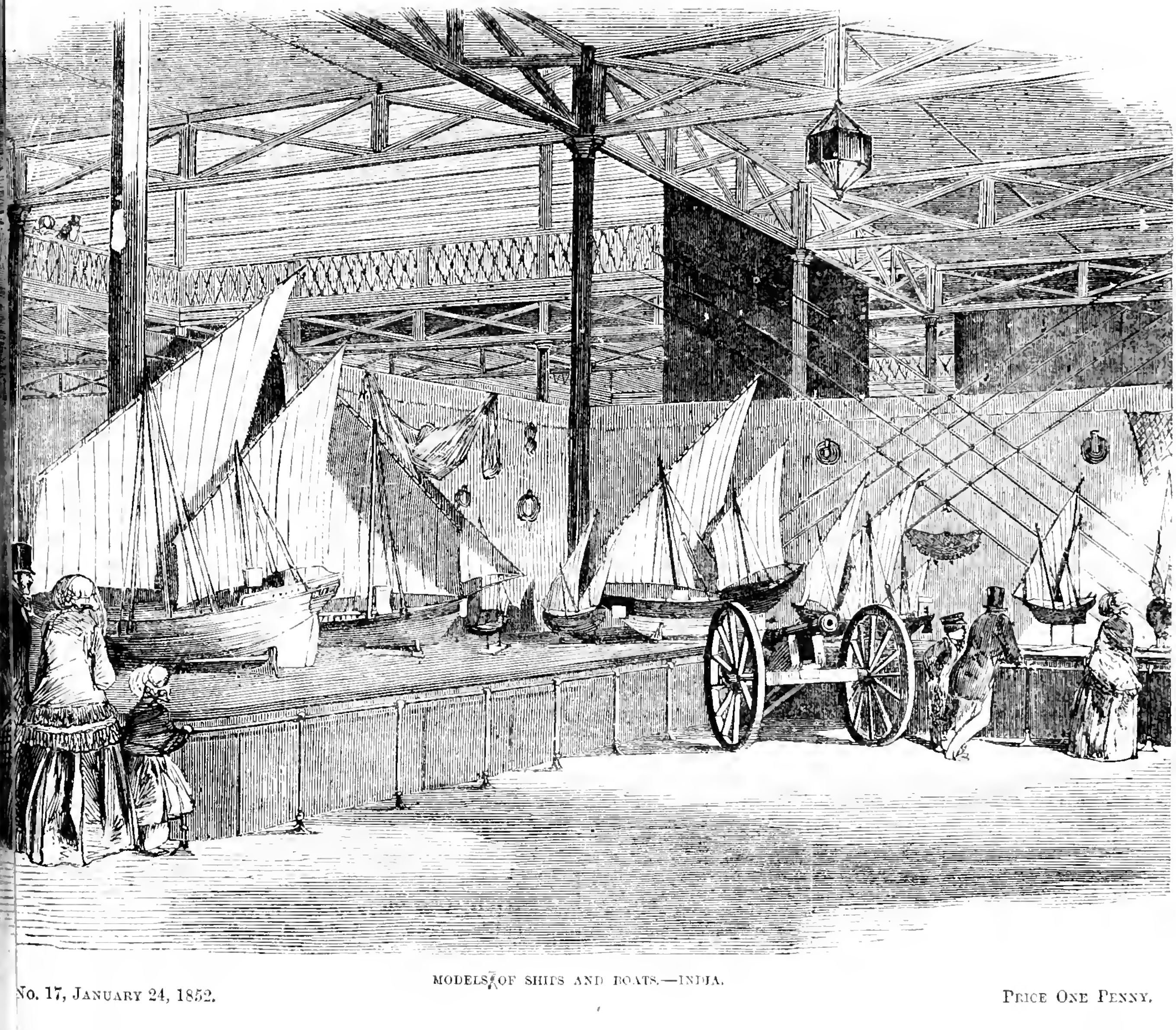
THESE little horse groups, which stood under the glass case in the Russian department, are remarkably spirited. They are in bronze gilt, and are admirably executed.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

THE NAUTICAL DEPARTMENT.

HERE can, we apprehend, be little doubt in the opinion of all connected with, or interested in, naval art and the national science of ship-building, t Great Britain, in her maritime capacity, was not adequately represented ithe Exhibition. If there was any one department of industry—any one ional pursuit to which, more than another, the place of honour, in all t meanings of the phrase, ought to have been assigned, it was surely that nected with our much-boasted empire of the seas; we ought to have d a complete epitome of the naval architecture of the realm, and, if ssible, also, a complete epitome (both by means of models, of course) of the history of ship-building in England from the earliest times; we ought to have been able to trace our progress from the days of the coracle and the primitive galley, founded, perhaps, in a great measure, upon Roman models, to the last screw-propeller man-of-war launched from Woolwich or Plymouth, or the last crack yacht set afloat at Cowes. A few ancient models were certainly to be found in the Naval Gallery; we had a model of a Roman war-galley, with four banks of oars, very curious; and another of the famed ship of Henry VIII., which carried him to the conference of the Field of the Cloth of Gold; another of a first rate, built in Charles I.'s time; and several of the not ancient, but old-fashioned, tubs in which



MODELS OF SHIPS AND BOATS.—INDIA.

Rodney and his sea-dogs won their battles. The collection was, however, but fragmentary: we had only scattered links of the chain which, if completed, would have formed one of the most interesting and purely national portions of the Exhibition. With these remarks, which we will not extend, we now proceed to describe the main features of the collection which was actually brought together.

It consisted, then, principally of models of ships of war, showing their lines; and, in a few cases, of section models, showing the arrangements between decks. Many of the former class of models were in what may be called *bas-relief*—that is, only one side of the vessel was represented, the object simply being to show her mould and run. These were arranged upon the western wall of the Exhibition, and were principally representations of vessels constructed in our naval dockyards within the last twenty years, many of them having been built during the long contest which agitated the naval world between the Surveyor of the Navy and his numerous antagonists. There were also a fair number of models of steam-boats—some screw and some paddle—some in relief and others entire. A large passenger-ship or two were exhibited, showing some of the most recent improvements in interior arrangements, and, after glancing at a number of minor rigged models of schooners and cutters, introduced rather as specimens of the skilled neat-handedness of their builders, than as exemplifying any principles of naval architecture, we came upon a vast variety of plans and inventions for life-boats. [Some account of these we gave in No. 15, p. 234, and we shall illustrate individual models in a future article.] On the other side of the wall on which the life-boats made so conspicuous a figure, was arranged a great variety of models of ship machinery, particularly that connected with anchorage, such as capstans, windlasses, chains, and anchors themselves. We had then a number of compasses and graceful designs for binnacles: and, lastly, after inspecting an omnium gatherum of naval odds and ends, such as the gun-harpoons for striking whales, and almost equally formidable weapons for shooting ducks from punts, models of oddly-shaped ships with sliding keels, and catamarans constructed out of spars of wood, and air-tight bags acting as buoys, we came to an infinity of diving apparatus, illustrative of the entire process of adventuring, remaining, and working below water.

We will first briefly remark upon the bas-relief models of men-of-war. Had the set been complete, or had specimens of different ages been copiously given, the observation of the gradually shifting forms adopted in our dockyards would have been specially interesting. As it was, however, we could gather from the collection hints not without significance. The first thing which strikes one in modern ship-building is the cutting down of the bulk which our ancestors were fond of rearing above the water. The castles, and quarter-decks, and poops with which they delighted to encumber their vessels, began first to give way at the bows; and the forecastle has long been a mere name, the thing having vanished more than a century ago. It was not, however, until a much more recent period that the mountains of timber piled up astern began to be reduced; and the naval battles in the latter third of the last century were fought by ships of the line with taffrails rising forty and sixty feet above the water. The tendency of improved ship-building is now to lay the whole expanse of deck as nearly as possible upon the same level. A few smaller vessels, we believe, have been actually built flush from stem to stern; but, at all events, the modest height of the quarter-decks now constructed contrasts strangely with the old notion of the symmetry and propriety of a towering poop, ornamented with all the art of the carver, and furnished with range over range of quarter galleries. Beneath the water-mark the tendency of advancing ship-building has been to adapt the curve of the swelling side, and the concave portions of the ship, which, in nautical phrase, "take most hold of the water," so as to prevent, as much as possible, the heavy and injurious rolling motion, which is increased by the quantity of weight a man-of-war must carry above the water, to cause the ship to sit as stiffly as may be, and heel over as little as possible—the special desideratum in a fighting vessel—and to arrange the lines of flotation so that the lowest tier of guns shall always be carried at least three or four feet above the water line. To these divers qualities the naval architect has, of course, to add the consideration of that of speed, and the delicacy of the ship in answering the slightest touch of her helm. The peculiarities of modern improvement in all these respects are easily observable, upon comparison of an old-fashioned with a newly-built hull. The bows of modern men-of-war are sharper and far finer than the old style; and there is more of the concave shape about them—a form which flings the seas sideways and backwards instead of aboard, as the old bluff bows used to do: the belly of the ship is by no means so round as it used to be, the sides or walls being far flatter, an improvement which diminishes the tendency to roll; and the dimensions of the part of the ship immediately before the rudder, called "the run," and in which the convex form changes into a pure and finely modelled concave, diminish so as to allow the body of water displaced to close quickly and easily, flinging its full force upon the helm. The spectator will observe that in modern ships this "run" is of larger dimensions than in the olden craft. An exception to this rule is, however, in some degree to be found in the vessels built under the survey of the navy. Take the *Queen* for example, a first-class man-of-war of 116 guns: a full model of her hull was exhibited, which for bluffness, and, to modern eyes, clumsy ugliness of mould, could not be beaten by any of the ships which carried the flags of the Byng or Rodney. The merits of the *Queen* have accordingly been long a fruitful theme of controversy in the naval world. Her best qualification is, we believe, that she carries her guns well out of the water; but she is slow, and rolls tremendously in a sea-way. In the lines shown of new frigat and gun brigs, it is curious to observe the approach to the style of buildi which has been long ago adopted in the construction of yachts—the bo sharper and finer than ever; "the runs" of great size, and delicacy mould; and the height of the ship attaining its extreme point when measur from the taffrail to the lower extremity of the stern-post. The effect of th latter arrangement, taking into consideration that the ships in question a made to sit with the stern low in the water, is to cause them to draw ma more feet of water aft than forward, to give them great steering power, a a strong firm hold of the water. The attention of the spectator may profitably directed to the models of the *Pique* and the *Inconstant*, two our heavy first-class frigates. Of these, the former seems the more gracefu but the latter has proved herself the most efficient vessel. Both t *Pique* and *Inconstant*, however, belong to the old school. Our first-cl frigates are now rated to carry fifty guns, and beautiful specimens of the are found in the models of the lines of the *Raleigh* and the *Arrogant*—t of the noblest ships on the water, and bigger than Lord Nelson's old sevent fours.

After inspecting the new-fashioned men-of-war, furnished with auxili screw propellers, such as the *Hogue* and the *Agamemnon*—vessels carryi the most formidable batteries of cannon ever borne across the ocean, and doubt destined to take a conspicuous part in our next naval war—if ever suc misfortune should arise—we may advantageously study the moulds of t little squadron of experimental gun-brigs, the evolutions of which excit so much interest some five or six years ago. There is no department of naval architecture in which we have made more progress than in t construction of the small men-of-war, called gun-brigs. The old vessels this class were a disgrace and a reproach to our dockyards. Over-mast deep-waisted, ill-modelled, they went down or went ashore with such regularity, that they acquired the significant nick-name of "coffins;" were still—not much to the credit of successive governments—emplo as packets, until the last of the fleet was either wrecked or worn Now-a-days, the gun-brigs form one of the most creditable departments the Navy. In this department of the Exhibition we saw the models— beautiful they are—of the fleet built both by private and official enterpr the peaceful records of whose cruizes filled so many newspaper colu half-a-dozen years ago. The precise question of their merits was never v fairly settled; but the general opinion was, that the *Mutiné*, the *Dar* and the *Espiègle* were the flowers of the fleet. The *Mutiné* afterwa greatly distinguished herself on the coast of Africa. The *Flying-Fish*, on the quickest of the squadron, was so wet, as seriously to interfere with comfort of all on board; but still, altogether, the vessels in question form perhaps, the most beautiful and best adapted squadron which ever w to sea.

A few, but only a few, models of merchant sailing-vessels were exhibi One of these was a perfect specimen of the latest improvements in first-c passenger-ships; we allude to the model of the hull of the *Owen Glendo* one of Mr. Green's splendid fleet of frigate-like merchantmen, built Blackwall. The capacity for stowage in this fine ship is beautifully combi with a faultless outward mould. Her bows are sharp, and have that sligl concave tendency which denotes speed and dryness, and the run is bea fully fine, and what sailors call "clean." In one respect the *Owen Glend* differs from the new fashion of flush building, now so prevalent. She ca a quarter-deck not too high, but of more than ordinary length, sufficiently lofty to allow an airy and comfortable cabin, with berths state rooms to extend below it. Thus the passengers are accommoda upon the level of the main deck. They have plenty of air and ventilat The height at which they stand above the sea allows of larger wind being formed than would be possible had they to descend a "compani to attain their cabin, and thus a handsome airy apartment is secu removed as much as possible from unpleasant smells, which are always stronger the further down you go in a ship; while a considerable spac gained beneath for extra stowage. A similar arrangement now generally holds in the American packets: and different modifications of same plan, such as round-houses, cuddies, and so forth, have been familiar to the passengers of East India ships. Forward of the deck ca in the *Owen Glendower*, is an excellent arrangement of pens for live st and a compact cooking apparatus: while the crew are accommod beneath a raised forecastle upon exactly the same principle as the passen abaft.

Above Mr. Green's fine ship stood a rigged model of a class of ve which is making great and rapid innovations upon old-fashioned merca marine—an Aberdeen clipper schooner. The port in question has ta the lead in the production of this very beautiful, very safe, and very class of vessel. Indeed, the Scotch ports on the eastern coast, particul Leith and Dundee, stand conspicuously out for their excellence in structing a new class of exceedingly elegant and exceedingly fast-g ships, which will, no doubt, gradually come into universal use. "clipper" is constructed upon the general theory, that a small amoun stowage-room may be advantageously given up to secure a great amo of speed, and with that speed a preference for cargo and a greater degre safety from the accidental risks of the sea; since no one can dispute th vessel able to go ten or twelve miles an hour, stability not being sacrifi must, in the nature of things, be a more secure ship in every respect t one which is able to go only five or six. The clippers were, we beli first built to carry up perishable cargoes of salmon from Norway and north of Scotland to the Thames. They are now commonly used in traffic

the conveyance of easily-spoiled goods, and for that of cattle, which are deteriorated in condition by being long at sea. The general fruit trade from the Mediterranean, the orange trade from the Azores, as well as the Scotch coasting traffic, are now almost entirely carried on by clippers—craft of as beautiful an appearance on the water as any of Cooper's slaving, or pirate, or privateer schooners, and able to go from the Nore to the Humber in the time which a clumsy Newcastle brig would take to work down the Swin to Harwich. The fast increasing class of screw-propeller boats—principally devoted to traffic in cattle, between the Thames and Ireland, and Holland—are also built and rigged on clipper principles; and Aberdeen has recently been asserting her right still to continue in the van of the race in naval architecture, by building clipper ships of large tonnage, one of which, in a voyage from China lately, beat an American ship, loudly trumpeted as the fastest vessel which ever bore the stars and stripes, and consequently, of course, in the opinion of Yankee land, the fastest in the world. The model in the Exhibition showed that the Aberdeen clipper schooners, while they are formed abaft much upon the ordinary moulding of a yacht—that is, as we have explained, with a long and fine run, and very high from the bottom of the stern-post to the taffrail—are modelled forward upon the principle of the bows of a Clyde steamer, involving great sharpness, rising into a concave shoulder of exaggerated hollowness compared with that mere tendency to concavity which we have described as characterising many new vessels both men-of-war and merchantmen. The effect of this construction is not to prevent the vessel pitching, but to cause her to pitch without being wet, the overlapping portion of the bows flinging the water downwards and backwards from the obstacle, while the sharpness beneath enables the ship to slide quickly and steadily through the water. As yet, with few exceptions, the clipper build is confined to coasting craft; but the initiative has been taken in the construction of large full-rigged ships upon the same principle; the success of more than one of which hailing from Liverpool and Aberdeen has lately formed the subject of newspaper paragraphs. Of the coasting craft, a few, but only a few clipper brigs have been built, the majority of the smaller vessels being schooners. In the rigging, considerable improvements, both as respects lightness and elegance, have taken place. The clipper is less towering aloft than the old-fashioned hermaphrodite schooner; but her yards are squarer, her boom and gaff longer, and she is thus enabled to carry as great a spread of canvass and to manage the cloth with more facility than the loftier rigged vessels. The old hermaphrodite schooner carried foremast, fore-topmast, and fore-top gallant-mast, and occasionally even a fore-royal mast, in all four pieces. The clipper uniformly contents herself with a foremast and fore-top mast, making up for the diminished height of the "stick" by the great squareness of the yards—the fore-top gallant-yard being sometimes, if we mistake not, made to come down upon the fore-topsail yard, so as to compact the rigging and diminish the leverage of the swing of high and heavy top hamper. The clipper has, further, an air of smartness and ship-shape which the ordinary merchant coaster is far from pretending to. She can go at double the speed of the lumbering collier-brig or coast-schooner, and shows beside them, too, like a hunter compared with a couple of dray-horses.

The steam-boat models were numerous, and not uninteresting. A number of bas-reliefs were shown of vessels in the process of construction by Mr. Mare, for the General Steam Navigation Company—craft of beautiful design, and which will, no doubt, turn out very fast; and there was a half-model of a 2000 tons steam screw-propeller yacht on the stocks for the Viceroy of Egypt, which has since been launched, and which deservedly attracted a great deal of admiration. A large model of a new paddle wheel steamer, fully rigged and complete down to the minutest details of finish, was placed in a prominent position, facing the eastward-running inner gallery, and repaid minute inspection as a peculiarly perfect model of a first-class craft of her species. She was flush decked and carried swivel signal guns upon her paddle platform. The floats of the wheels were disposed, not, after the too common fashion, in a plane with the spokes, but perpendicularly, so as to strike the water edgewise and to expend the whole force of the paddle upon a productive lateral, and not an unproductive downward movement. A number of contrivances, more or less ingenious, of feathering paddle floats were displayed, but we understand that it is found in practice that machinery of this sort, however theoretically plausible and however supported by abstract scientific laws, has such an unfortunate tendency to get out of order as to counterbalance the nominal advantages. With improved mechanical contrivances, however, it is quite possible that the feathering system may yet be made practically available, unless, indeed, the screw achieve the final overthrow of the paddle-wheel.

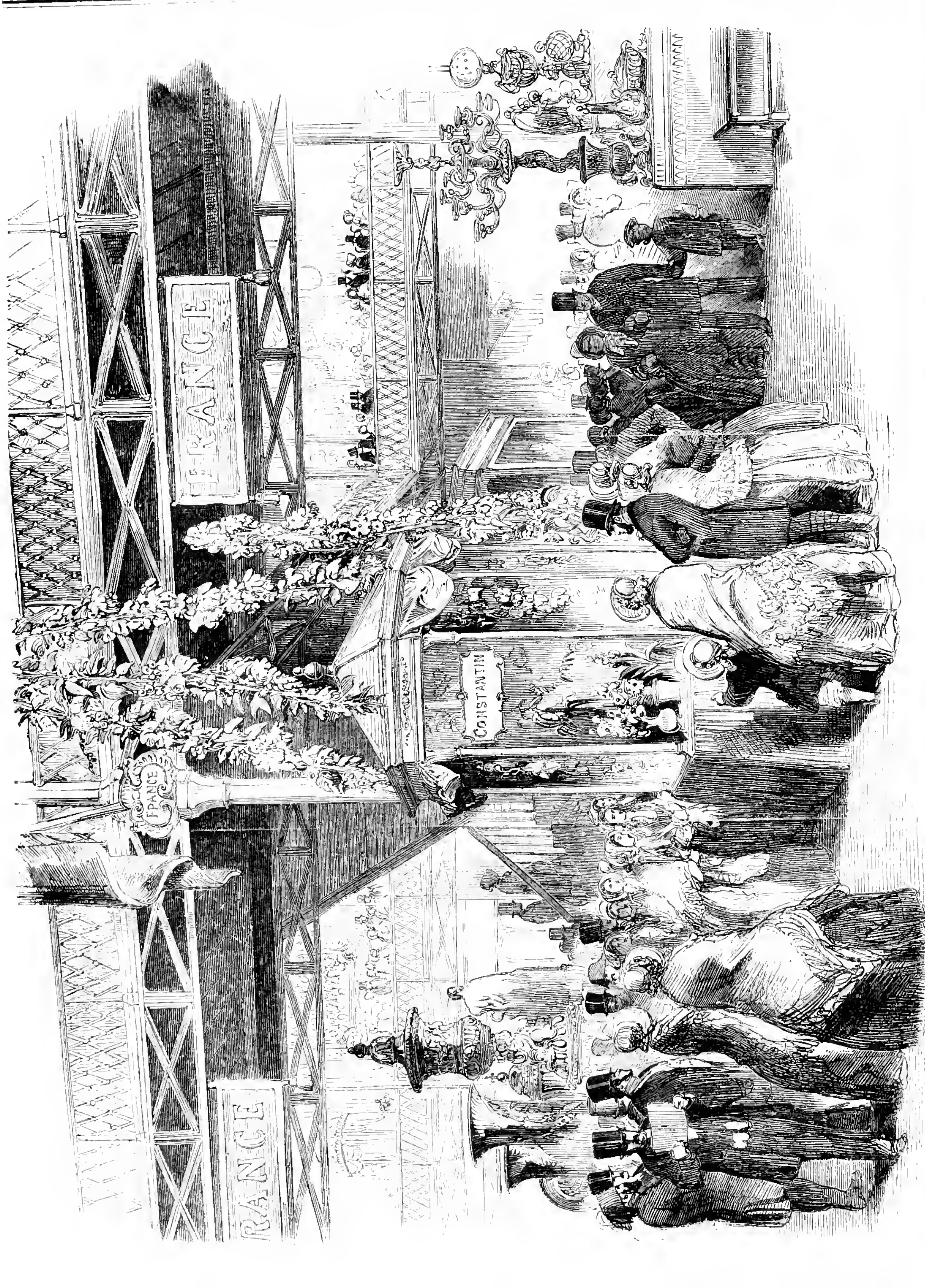
The models of the *Victoria and Albert* and the *Fairy*—the well-known royal yachts—excited much attention. We do not know, however, whether we are to place perfect credence in the miniature presentment of the larger vessel. Soon after the launch, it was pretty generally reported that she was a contemptible botch, and that all sorts of tricks and sly patching had been resorted to in order to make her sail respectably. Whether these stories were true or not, we cannot vouch, but it was often asserted, and never denied, that, as in consequence of some mistake in her lines, the *Victoria and Albert* went fastest when down by the head, she was ballasted so as to bring her into this position, and then built up upon, so far, of course, merely as the bulwarks went, and new painted to conceal her awkward sit upon the water. Be that as it may, however, the *Victoria and Albert* now goes very quickly through the water, a consummation for which she has, in some degree at least, to thank the immense steam power wherewith she has been provided. The *Fairy* is a sweetly formed and almost faultless little craft. Her speed in smooth water is wonderful, and the good weather she manages to make in rough, considering her lowness, is equally unrivalled. In crossing the Irish Channel in a gale of wind the day her Majesty returned from Ireland, we are told that, except mere spray, she did not ship a complete bucket full of water; while we can bear personal testimony to the fact, that the sea washed in tons over the fore part of the deck of the *Caradoc*, one of the new crack Holyhead and Kingstown packets, which crossed at the self-same hour. Not far from the model of the Royal packets was one of the screw steam yachts built by Mr. White, of Cowes, for the Emperor of Russia. The *Peterhoff* seems much such a vessel as the *Fairy*—very fast, extremely elegant and graceful upon the water, and made a good sea boat by the very force of her lightness and buoyancy, combined with a sharp wedge-like outline, which enables her to slip through head seas, offering them but a very trifling resistance.

In the same case was a large and handsome model of a Gravesend boat, the *Jupiter*, said to be the fastest on the river Thames. She is immensely long and narrow, with vast paddles, and will probably go at high velocity, but is only intended for smooth water. Close to her was deposited a curious contrast, in the shape of a model of a Roman galley, showing the way in which the oars were worked on board these eminently clumsy vessels. Beneath the water-line the model is round and lumpy, with very little indication of a run, but we much doubt whether any authority exists for the exact mathematical proportions actually observed by the early Italian shipwrights. What may be called the main deck is very low down indeed—a mere flooring, in fact, above the keel; but upon it are erected double platforms of four different heights, each platform seating five or six rowers, who grasp the vast sweeps by which the vessel is propelled. The arrangement of these sweeps is curious. The circular holes through which they pass run diagonally from the upper gunwale sternwise towards the keel, the benches within of course observing a similar disposition. Upon small patches of deck, running round the bulwarks, and crossing from side to side—somewhat in the fashion of a steamer's paddle bridges—the warriors stand; and at the stem and stern there are species of covered receptacles surrounded by circular wooden roofs, which afford shelter from the weather and the sea. It is difficult, however, to get anything like a clue to the actual accommodations for the continued residence of a number of men in these ships. The slaves who rowed—and awful slavery it must have been to tug these long heavy sweeps—probably took up their sleeping quarters upon the pricking-for-the-softest-plank principle.

The two *moyen-age* ships—the *Harry Grace de Dieu* and the *Royal Sovereign*, built by Charles II., were well worthy inspection. The former model was rigged, the latter only a hull; her form and general mould, however, differing in no remarkable respect from, and showing little advance in construction, over her predecessor, although the latter was built not less than 113 years before her. Both ships are piled up with huge unwieldy masses of forecastle and poop. In the *Harry Grace de Dieu* a number of circular sentry-boxes, or watch-towers, rise all round the bulwark, as though it had been the outer wall of a fortification, and the port holes are surmounted by ranges of loop-holes for musketry. The *Royal Sovereign* appears to have been built rather for purposes of pageantry than war. She is elaborately carved, principally with Roman emblems and devices; but we miss the warlike appendages of turrets and pepper-box towers which gave the true *moyen-age* ships the air of sailing castles—the idea of the architects having, indeed, manifestly been to manufacture a species of feudal floating fortress. The rigging of the *Harry Grace de Dieu* shows us the earlier stages of the combination of the still-existing square rig, with the lateen disposition of yards common to feluccas and their northern offspring—luggers. She carries three masts rigged square, with huge round tops; the two after-masts showing the lateen rig, which afterwards changed into the common schooner fore and-aft mode of slinging the yards, still in existence, and which is based upon the same principle as the felucca arrangement of the Mediterranean. Altogether, the two models are so interesting as to make us again regret that they only show two incidental eras in the history of our naval architecture—two accidental links in the chain which began with the log or bark canoe, and ends for the present with the 120 gun ship, carrying 84-pounders on her lower decks, and flinging thousands of pounds of iron at every broadside.

[Models of native boats were exhibited in several of the Foreign and Colonial Departments, which we shall describe in a future article.]

Dawson's Autophon.—Mr. Dawson's Autophon, which is simply a modification of the ordinary church organ with the addition of a pair of rollers, between which the perforated card boards or milled boards containing the tunes to be played are introduced, was placed among the pianos and other musical instruments, in the middle north gallery. The perforated sheets of music having been introduced within the instrument, by the operator turning a handle with his right hand, pass underneath the various pipes through which the wind from the bellows is forced. The bellows and pipes are, of course, differently arranged from those of an ordinary organ. The unperforated parts of the boards serve as valves to shut off those pipes that are not required in any given tune. A great advantage of this instrument is, that the tune may be in any key, and not limited as in the case of the barrel-organ. The operator is also enabled to dwell any length of time on any given harmony. In many rural districts, especially where the annual stipend of a professed organist is a barrier to the introduction of an instrument of the usual kind, Dawson's autophon will be found to be a great acquisition.



THE FRENCH DEPARTMENT.—CONSTANTIN'S ARTIFICIAL FLOWERS.—(SEE PAGE 267.)

FOREIGN AND COLONIAL DEPARTMENTS.

THE INDUSTRY OF FRANCE.—(No. II.)

IN our last article on the industry of France, we traced its progress through a series of official and other authentic documents issued by the French Government, from the time of Louis XIV. down to a comparatively recent period. How far its condition, as then shown, has been altered by the events of the last few years, it is no easy task to determine positively. It is well known that France, more than any other country, has suffered terribly by the late revolution, and it is but fair to bear in mind that, in the late industrial contest, she could not be supposed to bring into action all the resources which might be at the disposal of an undisturbed country enjoying all the vigour of its natural strength. As M. Dupin observed with reason last year, in his address to intending exhibitors—"If France could have chosen her own time for an Exhibition, she would not have selected the period between 1850 and 1852; she would not have selected that era in her life, when such severe struggles have enfeebled her for the present, and weakened her confidence in the future."

BAS-RELIEF IN CARTON-PIERRE.—M. HARDOUIN.

What change political events may have brought into her previous prosperity and productive powers, none but a local observer can well appreciate. An able writer, M. Audigame, has indeed instituted such an inquiry, and published the results of his personal experience; and these possess so much interest, and bear so directly upon the question before us that we are in justice bound to offer some quotations therefrom.

Manufacturing France, he says, may be divided into five zones. In the northern zone, which comprises eleven departments, is accumulated the greater portion of their industrial wealth. This tract is advantageously situated for manufacturing purposes. The vicinity of the seaboard, its connexion with Paris by means of a large river, numerous canals, and great facilities for procuring fuel for factories —all account for its position and increasing importance. Besides larger towns, such as Lille and Rouen, which employ some 100,000 hands each within their limits, that district contains other localities the names of which recall some special branch of manufactures, and rank conspicuously in the annals of industry. The eastern zone exhibits in several places an activity similar to that in the north. Mulhouse, Troyes, Rheims, Rive de Gier, St. Etienne, St. Chamond, Tavare and Lyons, compete with the large factories in Normandy and Flanders. Industrial pursuits are not, however, here so general; national activity splits itself into more diversified avocations; manufactures do not spring up as the natural produce of the soil. The southern zone, though not so far advanced as the eastern district, possesses, nevertheless, some fine and wealthy establishments. The Rhone and the Loire do not monopolise the whole of the silk industry. Nismes and the Cevennes are distinguished for kinds of industries peculiar to themselves; but under the benign climate of the south, labour has cast off its rude and uncouth appearance. Washed by the ocean, fertilised by the Loire, the Gironde, and other streams, western France devotes less attention to industry and manufactures than to foreign trade. The central zone embraces the whole of Parisian industry. When diverging towards the south to enter the heart of France, a country is to be seen intersected with mountains, valleys, and uncultivated lands, but having few manufacturing establishments; and the departments of Correze, Cantal, and Haute Loire circumscribe on one side, by farming or poverty-stricken tracts, that zone which presents at the other end so many wealthy industries, and so many splendid arts agglomerated together.

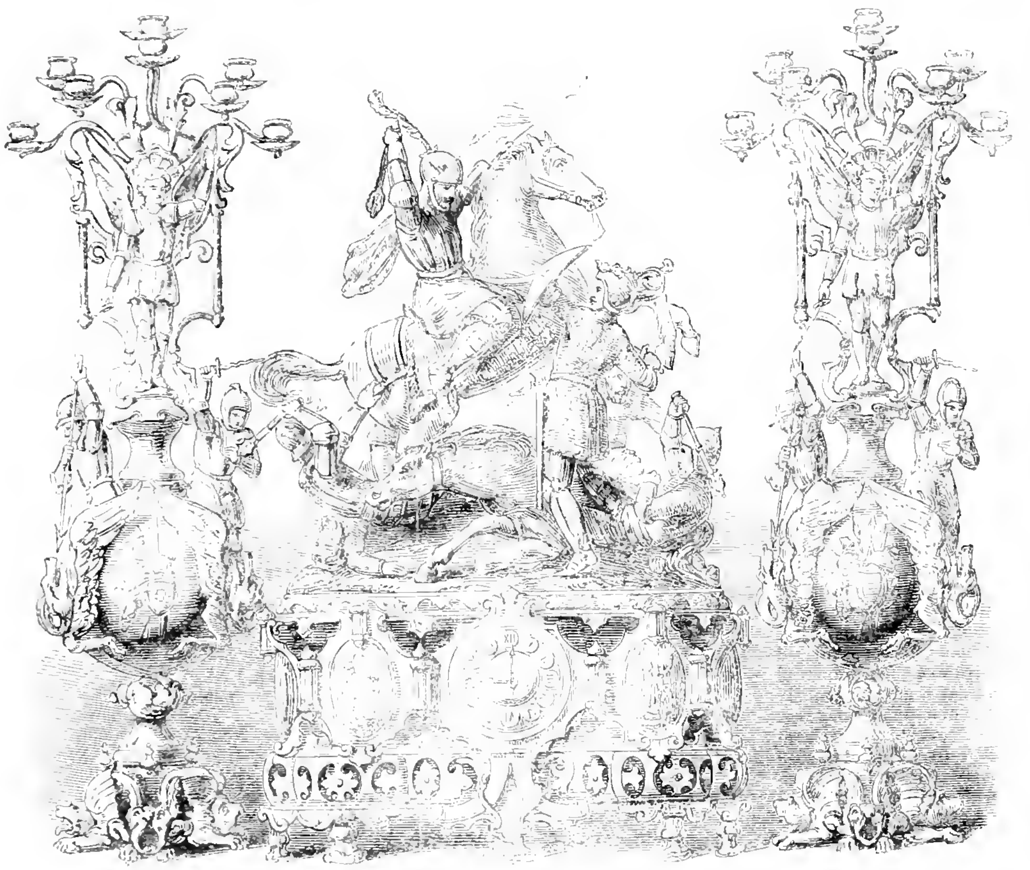
Retracing our steps, we find that the staple manufactures in the department of the North are the spinning into yarn and the weaving of cotton, flax, and wool. In the cotton yarn trade there are at Lille 34 large establishments, the capital sunk in which is not less than seven or eight millions of francs. Again, the lace trade in that town gives employment to 295 looms, the cost of which may have been 1,300,000f. During the recent crisis, the production of those two industries fell by one half short

MICHAEL OVERTHROWING THE DRAGON.—M. LE SEIGNEUR.—(SEE PAGE 267.)

of the average of the preceding years. The diminution is still more severely felt in the linen yarn trade, which possesses in this locality 49 establishments, setting at work 105,000 spindles and 10,000 hands, with a capital of at least twenty millions of francs. Orders for the army have alone kept up some activity in the factories at Armentières and Halluin. It is true that the trade had already shown symptoms of decay previously to the breaking out of the Revolution in February.

Tourcoing and Roubaix are, in the north, the principal seats of the woollen trade, and are renowned for their woolcombing and spinning establishments, and also for their carpet manufactories; Tourcoing is at the same time a great mart for native and foreign wools: out of 12,000 hands which those industries kept employed, about 8,000 were almost thrown out of employment by the Revolution. The woollen trade maintaining 30,000 artizans at Roubaix, and gives an annual return of 25 millions of francs. The spinning and weaving of cotton, moreover, require 16,000 hands on an average, producing some five millions worth of goods. But Roubaix had its share of public calamity. In March, April, and May, 1849, fabrication decreased fully one-third. The district of Abbeville is peculiarly situated: in all the country around a curious and traditional industry is prevalent—that of locksmith—which is known as "of Picardie." Each cottage is a miniature factory; each having its fire constantly going, its vice, &c. The articles are disposed of as quickly as made; and, being coarsely wrought, would lose much of their value if stored up. The breaking out of the revolution brought a discontinuance of orders, and consequently of labour. Thus, driven forth by poverty, those country locksmiths had no resource but to beg.

In the department of the Seine Inférieure, violent demonstrations had momentarily extinguished the last glimmers of an industrial activity not unlike that of the department of the North. At Rouen and its neighbourhood, the spinning, weaving, printing, and dyeing of cotton produce, for the purpose of internal consumption and exportation, a mass of goods valued at more than 250 millions of francs. The requirements of 270 cotton-spinning, 32 weaving, 43 printing, and 75 dyeing factories, give life to a considerable number of foundries, tanyards, leather-currying, engine-making, bleaching and dressing establishments. The spinning, weaving, and dyeing of wool at Rouen, Darnetal, and especially at Elbeuf, keep pace with the cotton trade in those places; but, with the exception of a momentary cessation, printed calicoes at Rouen were less affected than Rouenneries, properly so called; yet on the other hand—faring even worse than Rouenneries—the beautiful tissues of Elbeuf were left on the shelves unasked for, and scarcely a few hundreds of the workmen, producers of those cloths, were kept employed. In the other departments of Normandy, connected more or less with the industrial welfare of the Seine Inférieure, similar causes produced similar results. At Louviers, the warehouses of which had for many years been already overstocked for want of an outlet abroad, manufactories gave way under impending ruin, and loss of credit and foreign trade. The slackening of production was about one-third at Bernay, where the making of linen and cotton ribbons occupied 9000 hands, that of linens 4000, and flax, cotton, and wool-spinning about 2000 more. On the contrary, at Pont Audemer, the cotton and linen trade, though so severely tried in other localities, suffered less than the traditional industry of leather-dressing, which seemed to rest upon a more solid basis. The lace trade at Caen, in 1847, gave employment to upwards of 50,000 persons—that is, to one-eighth of the whole population of the Calvados. Thousands of females get their livelihood thereby. After the revolution of February, factors, receiving no more orders from the Parisian houses, stopped at once their operations. But the hosiery trade at Caen and Falaise, which is almost entirely taken up by local consumption, underwent scarcely any alteration. At Lisieux, the manufacturing of linen cloths, called "cretonnes," and of serges, are, like the preceding ones, branches of industry, as it were, innate to the soil, and have been so for many ages. The factories of this district weave annually 40,000 to 50,000 pieces of linen cloth, valued at nine millions of francs, and 100,000 pieces of "froes" of a similar value. The looms were often short of hands, and several times during the preceding years labourers had been sent for from Belgium and Holland; but in March, 1848, the foreign workmen went away, and the natives were hardly able to procure half the work they had been accustomed to get. In the industrial districts of the Orne, at Alençon, Serté Macé, l'Aigle Tinchebray, Vimoutiers, Flers, &c., the manufacturing of lace, linen, common cloth, pins and wires, cotton, &c., fell more than one-half under their previous amount of production. In the department of the Manche, which is the boundary of the northern section of France towards the west, scarcely any vestige of industrial activity is to be traced; but the link of the great economical phenomena engendered by the crisis continues unbroken in the last three departments of the same zone—the Aisne, the Ardennes, and the Oise.



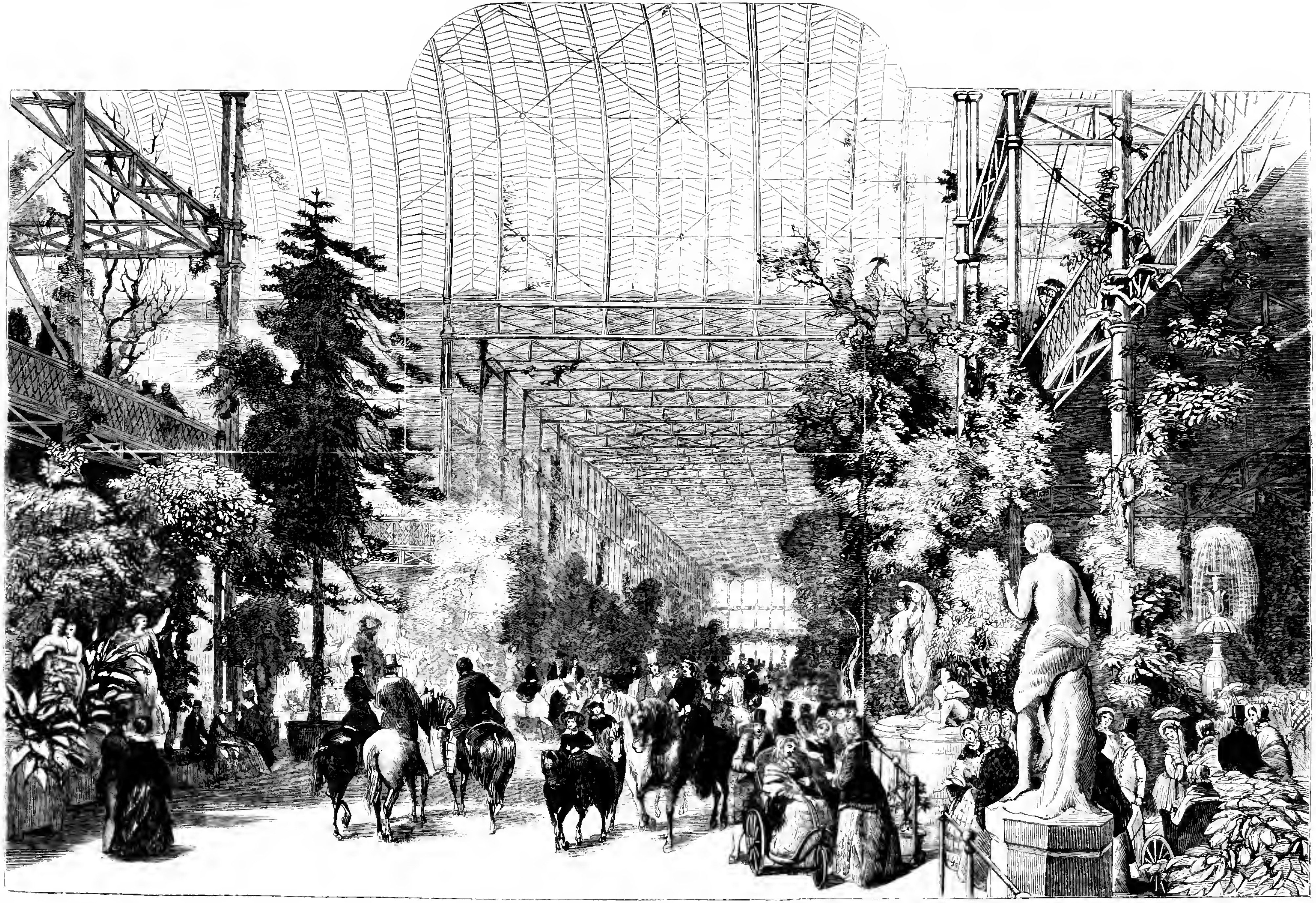
CLOCK.—LEROY AND SONS, PARIS.

fell short by one-third of what it had been in 1847, and consumption by about two-thirds.

The several industries in existence in the department of the Pas de Calais, viewed generally, seem to have suffered less. The preparation of oils, especially—which, in the districts of Arras and Bethune, keep 180 fires lighted—bore the crisis firmly, and maintained almost all its usual complement of hands at work. Not so the twelve engine establishments and foundries existing in the same localities; almost every one of which was compelled to stop working.

The lace and cambric trade, impoverished already by the powerful competition of Tulles, had fallen twenty-five per cent. The hosiery factories in the district of Boulogne, or more properly at Hesdin, cut short their production to one-third of the ordinary yield. The splendid flax-spinning establishment at Capécure, founded in 1836—working 8000 spindles, and employing 1800 hands—although assisted by the Chamber of Commerce and the local banks, gave way to the storm after a desperate struggle. At Calais and St. Pierre les Calais, the three flax-spinning establishments, which brought out annually two millions' worth of products, were obliged to dismiss the 1,500 workmen they employed. Likewise, in the department of the Somme (a part of the district of Abbeville) cotton, wool, and flax-spinning, the making of cotton velvet, and of wool, either single or mixed, hosiery, and the linen trade known as toiles de Picardie, gave sustenance to about 142,000 hands. Such of those manufactures as were more especially for the use of the wealthy, such as wool, fabrics, and whose designs vary with each season, were brought to a dead stand—while the others

The town of St. Quentin was formerly distinguished for its excellence in the most diverse industries. Previously to 1848, twelve cotton-spinning mills, setting 93,000 spindles to work, produced annually 500,000 kilogrammes of spun cotton—worth, on an average, three millions of francs.



THE CRYSTAL PALACE AS A WINTER GARDEN.

(FRENCH DEPARTMENT—*Continued from page 263.*)

numbered before February, 1848, not fewer than 140,000 spindles and 18,000 hands. Being the centre of this large traffic, and the chief manufacturing seat of the six departments lying at the eastern extremity of France, Mulhouse for several months stopped working the greater part of her looms, and reduced by one-half the work in those that were kept going. Reduced in ordinary times to almost nominal profits upon each yard of calico, and making up for the smallness of profits by the enormous amount of sales, the manufacturers of this town could not well stand the sudden fall of prices simultaneously with a considerable contraction of business; while in the neighbourhood of Mulhouse, at Sainte Marie aux Mines, the spinning and weaving of dyed cotton wool resisted the storm better, and, like the printed calicoes of Rouen, enjoyed a good run in the summer of 1848. Cloth and woollen stuff manufactories, cotton-spinning, weaving, and dying e tablishments, which in the Bas Rhin employed from 11,000 to 15,000 hands, the forges at Niederbronn, the hardware fabrics of Molsheim and Zornhoff, the iron works for the construction of machinery at Illkirch and Strasbourg, which gave employment to 6,000 more—all came to a stand-still in 1848, and, when revived, recovered but impartially their productive power. The metallurgic establishments of the Haute Marne, however, although previously impaired by several extraneous circumstances, did not bear without a show of energy the brunt of political events, and passed through the ordeal less exhausted than might have been anticipated. Almost all the forges and establishments in the iron trade having been shut up, and the works on railways entirely discontinued, it is needless to state that production fell much below the usual sum of 16 or 17 millions of francs, which is its yearly average, and which makes up about one-tenth or one-twelfth of the total metal cast in France. One fact may be mentioned, as illustrative of the state of the metallurgic trade in 1848: at the celebrated fair held at Besançon, called the Ascension Fair, where thousands of tons of iron are usually sold, not one could be disposed of.

The other branches of industry of the Haute Marne—the glove-making trade of Chaumont, which usually distributes seven or eight hundred thousand francs annually among some 3,000 workpeople as wages, and the cheap cutlery of Langres and Nogent le Roi, the products of which are about five millions of francs—have been reduced to a partial cessation, tantamount to the loss of one-half their usual productiveness. Not to mention 150 cheese-making dairies, churning 1,200,000 kilogrammes of cheese annually, the Jura department offers to the inquirer the most diversified industries scattered all over the country. Excepting the paper-mills of Saint Claude and Lessard, and also one cotton-spinning mill, no artizans are to be met with congregated into factories. In the middle of their family, near the domestic hearth, does one see here the toymaker at work, the clock, the basket, and the common cabinet-maker. Those several trades fell off, some one-third, some one-half; and prices declined some 35 per cent.

By its geographical situation, the department of the Rhone is naturally connected with the group of the eastern departments, but its staple trade belongs to the southern. The peculiar organisation of the Lyons trade is known by all; it is a well-ascertained fact that the loom there obeys and awaits orders. No accumulation of goods therefore, no anticipated productiveness, takes place there—the loom stops as briskness in orders slackens. Of all cities in France, Lyons could not but more keenly feel the effects of a crisis which weighed especially upon articles of luxury; while home consumption was almost null in 1848, the demand for silk fabrics from abroad was hindered by the political state of Europe. For several months, the working population of that city had no resource to live upon but the wages earned in the making of scarfs and banners bespoken by the Provisional Government. Like Lyons, addicted to the making of articles of luxury, the little town of Tarare is celebrated for its brocaded fabrics for furniture, and its plain and figured muslins. In the surrounding country upwards of 40,000 persons are occupied in muslin-weaving. The manufacturing interest struggled bravely against the crisis, but was here, as elsewhere, compelled to yield, and produce decreased about one half. Being of more modern growth in the industrial world, the department of the Loire nearly equals that of the Rhone. The city of St. Etienne, of which St. Chamond is, as it were, the satellite, presents the contrast of two branches of industry very dissimilar; ribbons, velvet, and lace-making face here the rough working of metals. The local statistics may be thus condensed: 110 to 120 millions' worth of products, and 80,000 to 85,000 artisans. Those numbers were reduced by two-thirds during the crisis, which caused a like havoc at Rive de Gier. In the glass-trade, for instance, out of forty-four kilns extant in the department, thirty-seven were at work in January, 1848, out of which twenty-seven were stopped in the course of the year, and 1500 people out of 2000 thrown out of employment.

In southern France, the brilliant industry which throws all the others in the dark—the silk trade—was severely tried in its several departments. At Nismes, where the making of silk and floss silk, together with figured silk fabrics, employs from 25,000 to 30,000 hands, prices having fallen forty per cent., work was completely stopped. Cocoons went off with difficulty at one-third under their usual value. Being more felt at Montpellier and Ganges, the fall of prices brought ruin on the spinning and silk-stocking manufactories. The same cause acted upon the silk-throwing and weaving mills at Avignon, and compelled several houses to stop payment. At Valenciennes, where the product of the factories reached, in years of prosperity, the sum of seventeen millions of francs, the owners of silk-worm nurseries, finding no sale for their cocoons, spun them themselves by means of small home-made, deficient, and expensive apparatus. Thus did that noble industry degenerate from the high position acquired by prior progress.

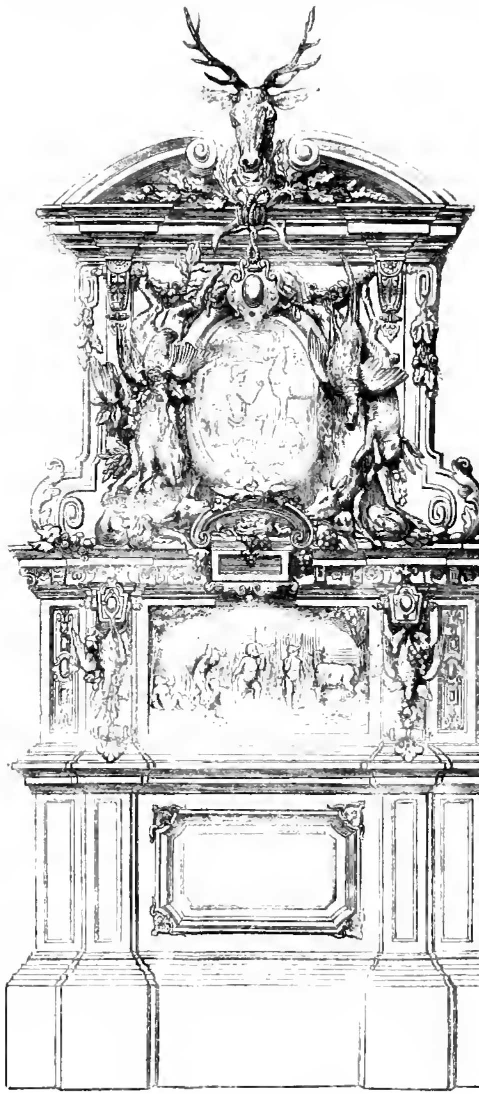
The importance of the large establishments in the Gard and the Avignon, and a few isolated foundries at Vienne, Toulon, &c., give to metallurgy the second rank in the industrial classification of the south. The causes of the slackening of business were the same as in the Haute Marne, and brought on a decrease of one-half in the aggregate bulk of goods produced. The chief manufactories are to be found at Vienne, Carcassone, Chalabre, Limoux, Bayonne, Rodez, St. Geniez, Castres, Montpellier, and Clermont l'Hérault. Some of those establishments, favoured with orders from the Government, were able to ride through the storm gently enough; but others, which work for exportation, received scarcely any order from abroad. The greater part, manufacturing for local consumption, had, in consequence of the national distress, their usual outlets cut off from them by the ordinary requirements of the population being curtailed. Concurrently with this stoppage of the weaving looms, an immense fall in the price of woods is to be recorded. The glove trade at Grenoble and Milhau: the preparation and dressing of leather in the latter town, undertaken on a large scale: the weaving of hemp and flax cloth at Voiron; and especially the soap and oil manufactories of Marseilles, deserve a particular mention in the productive inventory of southern France. With the exception of the tan, shammy, tawing trade at Milhau, and some trades peculiar to Marseilles, industry underwent everywhere a decline of one-half or two-thirds.

In western France, two towns only, Cholet and Mayenne, deserve the designation of manufacturing towns. At Cholet—the looms of which gave wages to about 80,000 hands, when flax was spun by hand—spinning-mills stopped from the outset of the crisis, weaving was discontinued for several months, while the cotton and woollen trade lost but one-half their usual complement. At Mayenne, cotton-spinning and calico and grey linen cloth factories, missed the summer season, and the inactivity of the manufactures lasted for several months, at a time when generally they are most brisk. The most important fabrication for the western departments is scattered over the surface of part of the ancient provinces of Bretagne and Marne. The names of Quintin, Saint Brieuc, Rennes, Morlaix, Laval, and Mamers, indicate the linen trade, already so much modified by the revolution created by the introduction of machinery. A few special industries peculiar to some localities give, however, life and variety to the otherwise monotonous picture of the western districts. Thus the paper trade of Angoulême, now four centuries old, gives an annual produce of six millions of francs; the hemp and flax mills of Angers work up the beautiful produce of the valleys of the Loire; the glove trade of Niort remains unshaken, in spite of the competition of woollen and cachemire gloves. Bankruptcy, winding-up, or, to say the least, considerable losses and partial inactivity—such has been the lot of the firms engaged in those trades.

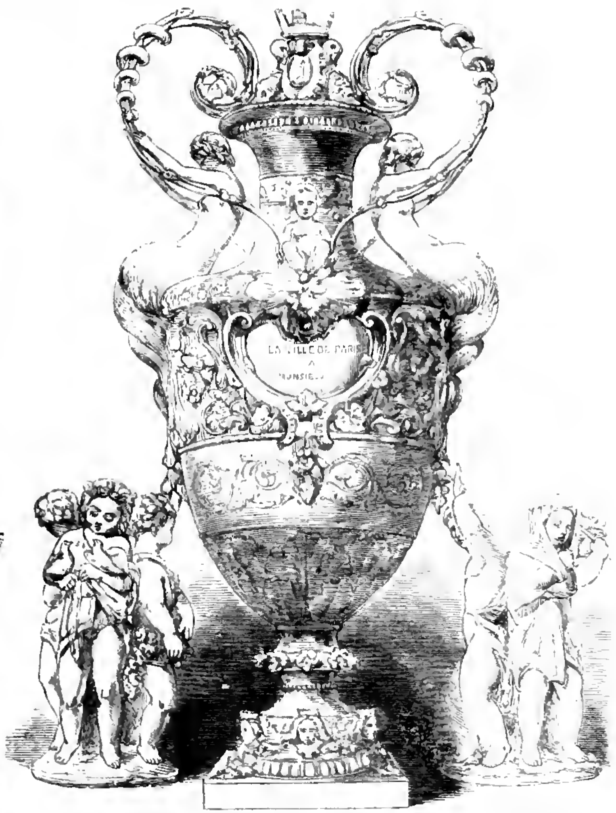
Central France, apart from the metropolis and its radius, contains somewhat more numerous manufactories. Textile industries are there represented by silk fabrics, trimming, and small ware articles, the carpets and cloths of Tours, the carpeting wonders of Aubusson and Felletin, the common but substantial cloths of Chateauroux, the linens and woollen tissues of Romorantin, the Limogese flannels and druggets. The large establishments of the Nièvre show the excellence of its metallurgic products; so does the cutlery of Clermont-Ferrand and Thiers. The porcelains of Limoges, the pottery of Tours, the earthenwares of the Allier and Seine at Marne, occupy a more or less conspicuous rank in the scale of the ceramic arts. During the crisis, the silk stuffs of Tours, especially intended for sumptuous furniture, kept scarcely any loom at work. The long-established manufactories of Aubusson carpets were compelled, by the dearth of credit and sales, to dismiss 3,000 workpeople. Chateauroux made a good stand in the industrial affray. Romorantin had produced weekly 7,500 yards of cloth, thenceforth reduced to scarcely 3,000. The immense works of the Nièvre, at Imphy, Fourchambault, &c., which required a considerable capital, and whose working expenses did not diminish in proportion to the decrease of business, experienced losses equal to a fall of one-half in the aggregate mass of their transactions. The cutlery trade of Thiers and Clermont-Ferrand gave employment to scarcely 4,000 hands, in place of 20,000. The twenty-four porcelain manufactories extant at Limoges, numbering thirty seven fires and 300 millstones, had, all but four, shut up and stopped in May, 1848. Without being so extensively disturbed, the other ceramic establishments of the central districts had to contract their production by about one-third.

With respect to Paris and its district, it is well-known that since 1815, and especially since 1830, the manufacturing interest has taken a prodigious extension. The metropolis of sciences and fine arts, Paris, has become an industrial emporium. The precincts and suburbs of Paris form around it, as it were, a belt of mills, manufactories, and industrial establishments of every description. In 1847 the establishments working by means of machinery, or employing more than twenty hands regularly, were 318 in number in the department of the Seine; they paid wages to about 30,000 persons of all sexes and ages. This does not include all hands employed in manufactories of a different description from the above. Parisian industry, properly so called—that is, cabinet making, bronze, gilt jewellery, paper, inlaid works, and twenty other fancy fabrics—supports

The spinning of wool, which had hitherto been checked and stationary, had also received a sudden and immense impetus. The productive power of the town and surrounding villages, such as Guise, Ribemont, St. Michel, and Fournires, had reached seven millions of francs. Not a skein, not a thread, left the country. The weaving-looms and factories resorted to by 30,000 workpeople took all that came out of the mills: and, though yielding ground to the formidable competition of Alsace, the cotton-spinning trade still occupied on the eve of the revolution of February, 40,000 hands. Fifteen thousand females of all ages, divided into numerous categories, were employed in lace and muslin embroidery. If to these principal industries are added bleaching, dressing, and other special establishments intended to give the last touch to tissues—and likewise important iron-works for the construction of engines and machinery—one may have an idea of the numerous interests accumulated in this place, which is comparatively of modern growth, and we could hardly find a spot which has suffered more from the political storm. During the months of March and April, 1848, almost all the factories had stopped working; and, taking a review of the whole year, the usual briskness of the place had abated fully two-thirds. In the Ardennes, the manufactories of Sedan had not been so totally stopped. The cloth-mills and metallurgic establishments of Sedan had in store, in February, 1848, a mass of raw material, which allowed fabrication to be carried on in spite of stagnation of affairs and fall in prices. On the contrary, the woollen trade at Réthel, the combing, spinning, and weaving interests, have lain fallow from the beginning of the crisis, being deprived of a similar resource. In the department of the Oise, wool spinning—being in this district entirely for high-priced and first rate articles for the wealthy—was struck at the root, and all the country artizans employed in the making-up of merinos, cachemires, &c., were left without means. A few more common articles, in the way of delft, earthenware, &c., experienced but a slight injury.



FRONTISPIECE—CRUCHET.



VASE AND TWO GROUPS IN SILVER.—FROMENT-MEURICE.

In the east of France, where important industrial centres are more distant from each other, the internal shock was not so continuously felt; but on entering manufacturing towns the same afflicting effects are to be noted. Rheims, for instance, was driven to close, in March, April, and May, the magnificent wool-spinning mills which were her pride. Communal workshops, on the model of the national *ateliers*, swallowed up, in a few weeks, an extraordinary loan of 400,000f.; and, had it not been for an order of 1,500,000f. for merinos, sent from New York at the moment when all means were exhausted, the crisis would have been desperate. At Troyes, which contains several important cotton-spinning establishments, whose products are absorbed by the local hosiery, glove, and knitted articles manufactories, all the cotton tissues made in the winter of 1847-8 awaited the spring and summer sales, when the Revolution burst out. Instead of being drawn off as usual, goods remained undisposed of, and filled the warehouses; and the mills, for want of fresh orders, stopped at once. On the other hand, metallurgic establishments in Moselle, the silk plush manufactories for the hat trade, the earthenware factories of Sarreguemines and Longior, the glass manufactories of St. Louis, Gœtzenbruck, and Forbach, and the tan-yards of Sierck, did not give way under the pressure; but the raw material was not forthcoming to the expectant artizan, and the loss of credit prevented any important outlay. The embroidery trade at Nancy suffered to such an extent, that 25c. wages per day were hardly doled out to the women employed in that branch of industry.

The cotton-spinning trade in the department of the Haut Rhin

(*Continued at page 266.*)

ards of 60,000 artisan families. It would be useless to expatiate upon effects of the crisis, in so far as related to the industrious classes and he productive abilities of manufacturers, otherwise than to observe fancy articles and costly goods are more likely than others to suffer mes of general distress; and although no official returns have been lished on the subject, yet, if the reports attributed to competent ies, who have been consulted on the subject, are to be implicitly ited, it would follow that the loss to Parisian industry was not at the less than nine-tenths in sale transactions, and about seven-tenths in usual amount of goods produced; while, in other departments of manu- res, the difference seems to have been respectively two-thirds as to , and one-half as to the amount produced.

we now recapitulate all the above, we find that in the aggregate the s must have been, in the commercial transactions of France, to the it of one-half what they are in their normal state. The amount of s produced is valued at (the minimum) 2,000 millions of francs; out hich the four staple manufactures of textile fabrics, linen, cotton, silk, wool, claim 1,600 millions; making the loss in one year, respectively,) and 800 millions; while wages, calculated at an average of 1f. 25c. liem, will show a dead loss to the working population of 312½ millions ncs.

ow far France may have recovered from the shock, cannot yet be ascertained; but evidently—even taking matters in their best light, supposing an almost complete revival, of which some symptoms t lead one to believe the existence—the causes continue to act which produced those effects—anxiety, fear, apprehension of the morrow, mpoverishment.

VASE AND TWO GROUPS, IN SILVER. BY FROMENT-MEURICE.

display of ornamental and sculptured silver by M. Froment-Meurice was, altogether, the handsomest on the foreign side of the Exhibition, of the works displaying an amount of artistic feeling and executive r worthy of the days of Cellini. The very handsome vase represented r engraving is one presented by the city of Paris to M. Emmeny, an cer of eminence, to whom the Parisians are largely indebted for their nt water supply. The sculpture is by Klagmann, and is partly done *oussé*, or by punching, and partly cast; the whole richly chased and ved. The little groups on either side are two out of twelve repre- ig the months, or seasons—very elegant little works, about ten inches and all done *en repoussé*.

CONSTANTIN'S ARTIFICIAL FLOWERS.

of the most attractive and beautiful objects in the French department the case containing Constantin's artificial flowers. We wish we could, n our limits, do justice to the exquisite truth and delicacy exhibited . Constantin in an art which he may fairly be said, if not to have ed, at least to have brought to a point of excellence which it had never ed before. We may briefly observe that these productions are hardly called artificial flowers, in the every-day sense, being in beauty and most everything but smell, identical with those of nature. Roses, hot-house plants, ivies, and endless other varieties, are here before us, were, *in propriâ personâ*, and not always in full bloom, but occasionally sented, with most truthful effect, in their way of declining and ring, with the canker-worm at the core, and blight upon the face. All wonderful realisations are produced in one material—cambric; and high praise is due to the artist who has achieved what he has done it.

FRONTISPIECE.—BY CROUCHET.

is a handsome piece of ornamenta- in carved wood and carton-pierre; objects relating to field sports.

CK AND CHIMNEY ORNAMENTS.—BY LEROY AND SONS.

decoration of this group of objects is *hivalresque* character, and is worked with an expressiveness of spirit, and a delicate finish in the details, for Parisian workmen are justly cele- d.

XICAN FIGURES AND DOLLS. BY MONTANARI.

beautiful groups of Mexican figures ted by Montanari, in the Fine Art , daily attracted a throng of admir- zers. They were indeed very inter- , as illustrating town and savage life xico in all their phases. Amongst the most remarkable were a gro- figure of an "Aguador" (water-); a "Remendor," or street cobbler, ragged attire; "A Confessional," of three figures; a group of two Indian women dancing a fandango on the green, while the [illegible] on the guitar; and [illegible] farmer and his lady [illegible] "Mexican Fruit" [illegible] ture. In the North Transept Gallery, Class 29, Case 122, were a rich display of model wax and rag dolls by Madame Montanari. The [illegible] indeed very beautifully modelled, [illegible] and eyebrows. They represent the different [illegible] up to womanhood, and were arranged in the case [illegible] family groups. They include portraits of several of the Royal children. The interior of the case represents a model drawing-room, the model furniture being carved and gilt, and elaborately finished. [illegible] in an adjoining small glass-case, was a newly [illegible] Madame Montanari, peculiarly adapted for the [illegible] bility, and are largely [illegible]

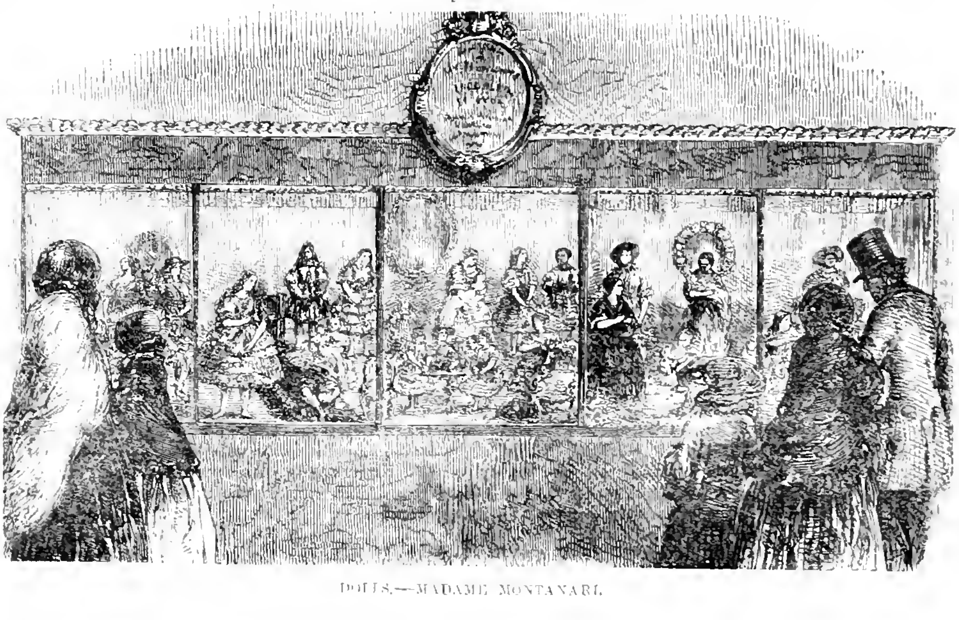
SCULPTURE.

In our present sheet are engravings of four works of sculpture of various schools. Mr. Lough's equestrian plaster group, entitled "The Mourners," had numberless admirers amongst the idlers who thronged the main avenues of the Palace of Industry; and it spoke home to the feelings of many of that extensive class whose hearts are always "open to a tale of distress." If the heart, therefore, were the only guide to be consulted in the consideration of works of design, undoubtedly Mr. Lough might be said to have achieved a very great success. In point of sentiment, however, even of every-day sentiment, there does appear to us a little extravagance and inconsistency in placing a horse and a Christian widow in a partnership of sorrow. For even supposing the horse had a right to indulge his feelings on the occasion of the loss of a good master, as well as the bereaved wife, he might have been kept a little in the back-ground; at least, the woman should not have been called upon to bestow any of her attentions upon the dumb animal, when she should have been exclusively engrossed with the appalling sight of a husband, untimely slain. These are errors of poetic judgment, which throw sentiment into ridicule, and reduce art to the level of an Astley's melodrama. As for the idea of the group itself, it is obviously taken from Horace Vernet's celebrated picture of "The Dead Trumpeter." In that work, however, the sentiment is more consistently carried out; the mourners over the corpse of the soldier who, has just been shot dead from off his saddle, are the horse and a favourite dog, who licks the yet bleeding wound. The horse by his startled look and cautious tread, tells the whole story, which is true to nature. But there is no arbitrary and artificial blending of brute instinct and human sorrow. Finally, we must add, that the subject, from the very form of the outline of the objects introduced, whilst very appropriate for a painting, is wholly improper for a work of sculpture unless in the modified form of a bas relief.

Foley's "Wanderer" tells a plaintive tale of the "winter's wind," which blows and whistles about him, and threatens to tear his cloak from his back. He casts an appealing look to heaven, and struggles on still, against its vigour.

The "Girl at the Stream," by Widdersfield, though a work of slight pretensions, is delicately treated, and had a pleasing effect amongst the various statuary groups in the transept.

M. Le Seigneur's colossal group, in plaster, of "St. Michael overthrowing the Dragon," which stood in the East Nave, is a specimen of the more exaggerated school which prevails to an alarming extent amongst our French neighbours. It is vicious in composition, and disturbs the eye with innumerable angular projections. In fine, it has all the vice of ill-studied and incomplete action, whilst there is nothing in the character or expression of the principal figure (whose costume is absurd) to redeem the more glaring defects of the composition.

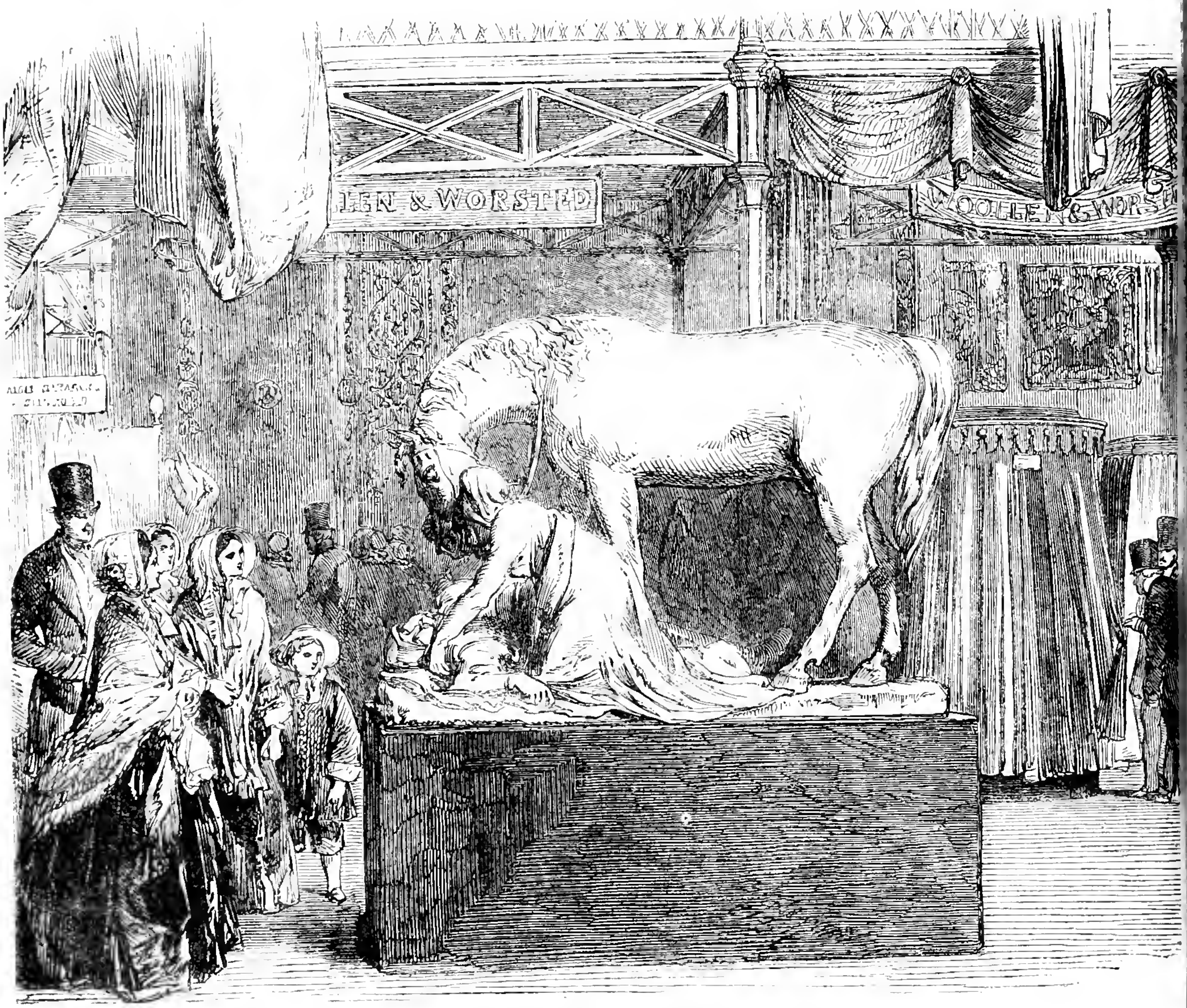


DOLLS.—MADAME MONTANARI.

MISCELLANEOUS MANUFACTURES.

FRINGE, GIMP, ETC.

IT appears that the custom of appending fringe as a decoration to costume and furniture, of even the rudest dwellings, is to be traced to the very earliest ages of man. The graphic records of past times, either in sculpture or otherwise, furnish ample evidence of its adoption in those periods of which we have the unquestionable vouchers. All nations have likewise been accustomed to its use, however barbarous or uncivilised the state of



THE MOURNERS.—LOUGH.

he people: and the dresses of the savages and aborigines of Africa and elsewhere testify to the existing fondness for such a means of decoration and display. Indeed, amidst the apparently confused jumble of paraphernalia worn by the Indians, are mostly to be found portions of native manufactured fringe, displaying great art and facility in design, and elaborate neatness and order in their execution. Few of these specimens of embroidery are to be met with of late unadorned with beads, these latter introductions of European traffic taking the place of small pebbles, shells, &c. In this respect there exists but little, if any difference, between these productions of so-called savage life, and the results of our best manufactures, with all the accessory aid and attributes of science and art. As a somewhat partial corroboration of this view, we would, *en passant*, instance an apron of crochet work, remarkable for the beauty of the pattern and execution, exhibited in avenue 1, area 30 (Ionian Islands), showing that what has but recently appeared in England as an accomplishment, has been for ages the common needlework of the Ionian peasant girls. Doubtless many of the first notions of fringe were obtained by the leaving unent the ends of the material used in making nets, the fraying of fabrics, and the consequent necessity of stopping its extension by knots, the additic small weights to keep down drapery at the entrance to tents, &c.

There are some splendid specimens of fringe of early English Flemish manufacture to be found in various noble mansions throug England, and which have been eagerly sought after and as eagerly cc by the British manufacturer, who in this branch of trade closely com with, if he does not excel, every other. Indeed, the specimens of our fringe in the Exhibition fairly outvie all that has been contributed from foreign source (if we except colour) in the essential requisites of t material, and finish. Ere we commence our detailed description, we allude to a room at Dotesio's hotel, at Slough, entirely fitted up in ne work and embroidery of the time of Louis Quatorze, and in which is found some of the most magnificent fringe of that gorgeous period. beautiful little gossamer-like tassels which hang in clusters to the the chairs, and the ottomans, are of the most pure and exquisite d and, what is still more remarkable, there are, as we believe, no two We were forcibly reminded of these elegant appendages while examin

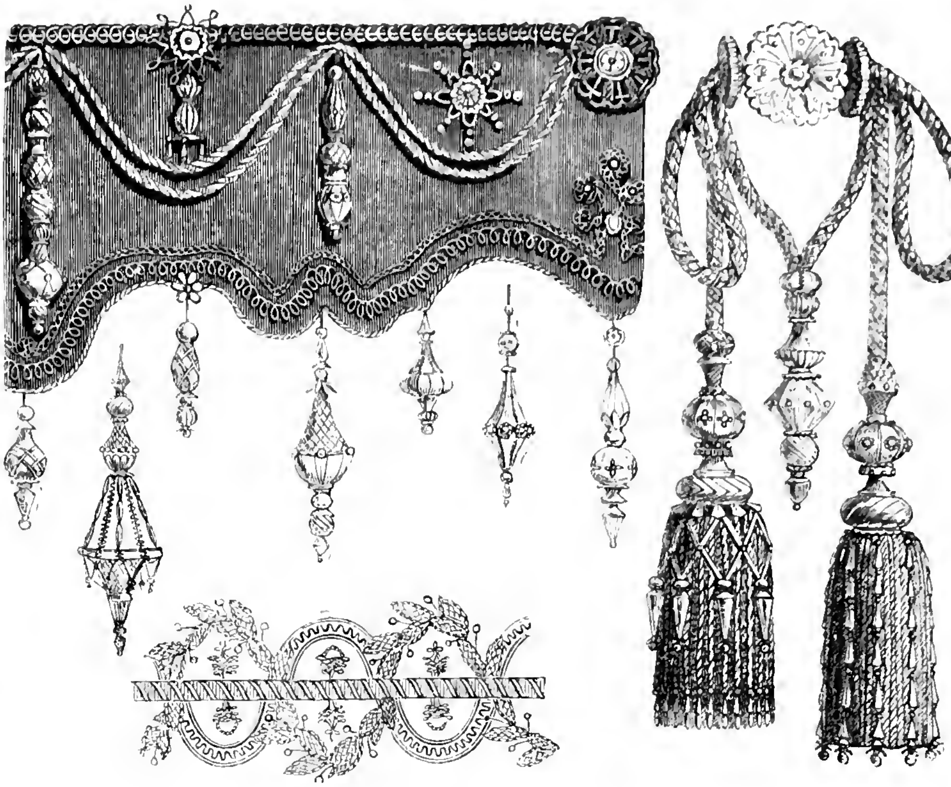
No. 56, in Class 13, contributed by Elizabeth Onion, of Birmin Here were several *fac-similes* of the fairy-like tassels we alluded to they are not used as independent objects, but made to dangle atten around some burly bell-handle, or attend in clusters upon their weighty, but less elegant, connexions. This display of Mrs. Onion's a very handsome one: very elaborate work has been enlisted; but elaboration, as in the tassels made mention of, has been qualifie breadth of parts and a sufficiency of repose insured to sustain a desi harmony of composition. Most of the tassels embrace in portions the of regal crowns, but the outlines are sufficiently disguised to remove obvious mechanical effect, while enough is evolved to induce the niscence of a preconceived notion of grandeur.

N 69, Ann Arthur, Mortimer-street, though next to the last-mentioned, is far removed from her in regard good taste. The objects are poor and wanting, the imitations of flowers execrable. Some of the tassels, those of the more simple kind, are but whenever an attempt to im- has been made, failure appears to followed.

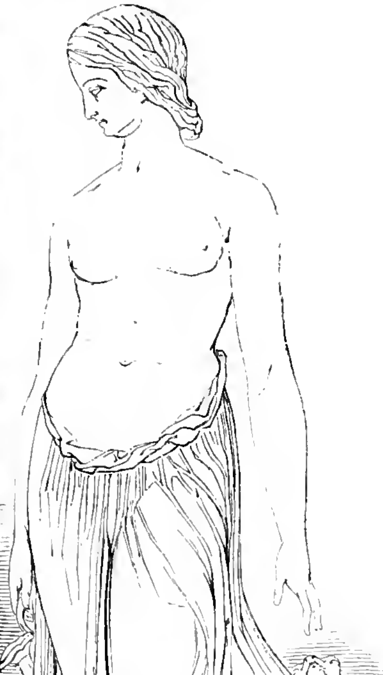
N 68. Foot and Son, Spital-square, formed by a combination of and brocade. This appears to very happy mixture of materials, can readily conceive, with such ances, much more could be done has been here effected. In some specimens the appearance is dingy unprepossessing. The silk fringe centre of the compartment of and white, and that of salmon , is very neat and pretty.

N 71. Danby and Co., 43, Bond- exhibited several imitations of owers and leaves, which are more s than enticing. They have an aidenish stamp. The cords and are of considerable elegance, and ir lightness of appearance.

N 72. C. W. Bradbee and Son, te-street, exposed a few of the harming silk tassels it is possible ceive. They are very simple in form and construction, and are copied from Oriental originals. inges for sacred edifices are more than tasteful.



TASSELS AND FRINGE.—BURGH.



THE GIRL AT A STREAM.—WIDDERSFIELD.

Evans and Co., Watling-street, exhibited cornice, silk, bullion, and ornamental fringe, of an exceedingly useful and solid, but by no means *recherché*, character. The bell-pulls and curtain-holders were remarkable for an excellent arrangement of parts; comparatively ancient examples have been carefully studied and judiciously made use of, a correct balancing of the various figures being observable. The silk cord for the ornamentation of curtains was likewise deserving of mention; and the whole of this selection had clearly been placed under the supervision of an artistically educated eye.

No. 394. Bennoch, Twentyman, and Rigg, 77, Wood-street, had two cases containing a greater variety of produce than any of those adjoining. While under one number we found specimens of sewing silk and twist, in another the same articles with shoe ribbons added, and in others excellent specimens of upholstery fringes, gimps, or dress trimmings, here we found a concentration of them all. There were a few skeins of purse silk, or netting twist, representing a production of three or four hundred pounds weight per week; a few balls of twist used for button holes, of which a like quantity is made, and a few skeins of sewing silk of a peculiar dye called *raven*, or it may be jet, standing for a business of 2000 lb. weight per month, or equal to 26,000 lb. weight per annum. Here, too, were boot-laces, from 8d. to 9d. per gross of 144 laces, tagged with tin or brass at each end; one would imagine, that, to cut the cords, tag them, and afterwards tie them in bundles, would be barely paid by the money. The little boys of seven to twelve years of age employed in this trade (and there are hundreds) will, in the rooms where such goods are made, trot from twenty to thirty miles per

THE WANDERER.—FOLEY.

day, or equal to half the circumference of the globe every year. Here was a box with a few rings of wire enveloped in cotton, or covered with silk, used to stiffen or keep in shape the bonnets of the ladies; and when we learn that at least thirty tons of iron, with a proportionate quantity of cotton and silk, are consumed in the fabrication of this apparently simple article, how it seems to enlarge our views in relation to commerce! Let no man pronounce this insignificant, or that trifling. There is no such thing as insignificance in the arrangements of nature, and as little in the harmonies of commerce. Things which at first sight appear unworthy a moment's thought, on being explained, expand before our vision, and we picture to ourselves the tens of thousands of pulsating hearts and humble homes rendered happy and comfortable from the enterprise of the manufacturer who points a pin, as well as from the titanic power that forges the anchor. Here, also, were reels of twist, looking like silk, but in reality two-thirds cotton—the cotton being plated with a thin coating of silk. This material is used for embroidering lace at Nottingham, or woven into fringes for mantles at Coventry. We believe it was mainly through the encouragement of the head of this firm, that a principle was discovered by which such articles could be produced by machinery, instead of by hand, as formerly. Many months of study had been devoted to the subject, and it was about to be given up in despair, when Mr. W. Unsworth, of Derby, hit upon the process. The effect was instantly felt; goods that were usually sold at a shilling were reduced to threepence. Articles confined to the comparatively wealthy, were brought within the reach of the comparatively poor. Germany, Holland, and Belgium were supplied by our manufacturers with goods they had previously produced for us; while America and the cities on the shores of the Mediterranean became important customers. Several thousands of persons were occupied in Warwickshire and Derbyshire in fabricating gimps, fringes, and other fancy articles. The trade was established, and a new branch of manufacture added to the industry of England: we may add, that along with the articles already enumerated were excellent specimens of coloured ribbons from Coventry; blond ribbons, braids, cords, and fancy silks from Derby; handkerchiefs and ferrets from Macclesfield; sewing silks from Leek; various galloons, &c., from Manchester; and numerous combinations of lace with ribbon gimp, &c. from Nottingham, all worthy of inspection. As these notices are for the encouragement of those whose labour and capital are embarked in commerce, as well as for the information of those who wonderingly look on, it is cheering to learn that such firms as those whose productions are now under notice give direct employment to two or three thousand persons, and incidentally provide for three or four times that number. Who can calculate the amount of good they do? To all such we would say, go on and prosper, reaping the reward your enterprise so justly merits.

Robert Burgh, whose house has been long in this business, made a very rich and varied display, some articles from which we have engraved.

No. 76. Barrett and Corney. A rich collection of gold and silver cord and fringe: some of the cord made with either gold or silver is interlaced with coloured silk, and is peculiarly chaste in style. In this case was a ruby jewel hole through which the gold wire is drawn, and which is supposed to be the finest hole ever pierced. "The wire drawn by its means runs 2820 yards per ounce troy, and the gold used in gilding it actually measures at the ratio of 338,400 yards, or 192¼ miles per ounce troy!"

No. 57. Burke, 6 Bull's Head-court, Newgate-street, exhibited several examples of embossed trimmings of great beauty and design. This embossing is done very readily on any kind of silk, linen, paper, &c., and although in regard to dresses it will, of course, wash or iron out, we can readily conceive that at the cost of a little time and expense the best examples of decoration might be renewed with much success. The cut-through patterns have not this objection, and are equally remarkable for their quiet, lady-like appearance. We think this an application which is within the reach of most persons, and capable, in gifted hands, of being carried into a very wide field of decorate usefulness.

No. 80. W. and H. Browett, Coventry. The trimmings of these gentlemen enlist attention, from their great beauty and the variety of the assortment.

No. 206. T. Wheeler and Co., of Abbey Mills, Leicester, had an endless variety of fringe, all more or less creditable to the capabilities of Leicester.

In the Austrian department C. F. Muehlenderlen exhibited gimps, fringes, &c., all of a very common, not to say inferior, description: and Oehmig and Schmidt, fringe in worsted of a heavy character and tawdry effect.

Posamenter, of Breslau, at the entrance to the South Gallery, exhibited pieces of carriage and furniture fringe of a superior description: next to which was Heindrich Zeisig, of Breslau, whose carriage fringe was likewise commendable, but whose bell handles are conceived in the worst notions of that requirement.

In the French department we had nothing that approaches to the British groups, if we except some very broad and elaborately wrought fringe made for Messrs. Jay, in which a cut jet bead (not the common bugle) is introduced with admirable effect. This fringe, in some instances, is ten or twelve inches broad, and in the closer portions arabesque and other patterns are introduced with great correctness of outline and exquisite finish. It is of a most expensive description, being intended for mantles for our English aristocracy and more wealthy classes. For brilliancy and richness of colour there is no one in this department can vie with Guillemot Brothers, who have contrived, by the simple aid in each specimen of two or three shades, to produce a most striking and gorgeous effect of chromatic harmony; and they have been equally fortunate in this essential requisite in their carriage and furniture fringe, in the latter of which they have made a bold and successful attempt to imitate precious stones set in gold.

No. 1414. Pugin, Paris, contributed carriage and furniture fringes, wl while they do not approach the last mentioned for the exalted gift of co are good from a certain care and attention to arrangement and f Jullien, of Tours; J. Mormieux, of Paris; Repiquet, of Lyons; and M. R of St. Chamond, show severally specimens of fringes which may al placed under the same category of tolerably well manufactured.

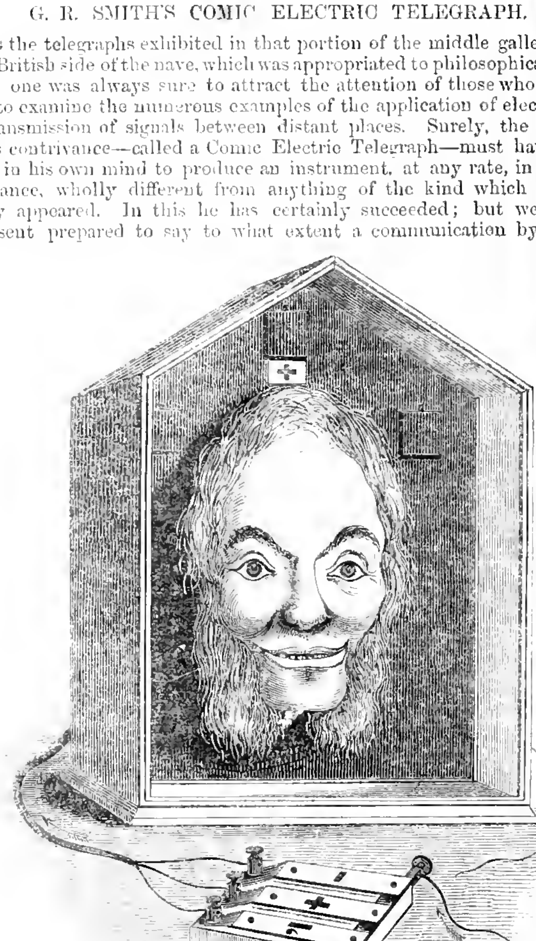
No. 50. Behr and Schubert, of Frankenberg, Saxony, had a flag of dc satin with fringe.

No. 153. Haenel Brothers, 155. Uhligo (Annaberg), 158, Bach and and 160, Hillman, all of Saxony, exhibited various fringes, tassels for tains, sewing and ball fringes, half silk bullion, which were princi exhibited for cheapness and execution, but which, while they possess r merit, are almost destitute of novelty.

The only other examples of fringe which we could find were in Portugal and Madeira department, 1155 to 1157, bell-ropes and ta which did not repay us for the search.

G. R. SMITH'S COMIC ELECTRIC TELEGRAPH.

Among the telegraphs exhibited in that portion of the middle gallery r of the British side of the nave, which was appropriated to philosophical in ments, one was always sure to attract the attention of those who che pause to examine the numerous examples of the application of electric the transmission of signals between distant places. Surely, the inv of this contrivance—called a Comic Electric Telegraph—must have d mined in his own mind to produce an instrument, at any rate, in ext appearance, wholly different from anything of the kind which had viously appeared. In this he has certainly succeeded; but we ar at present prepared to say to what extent a communication by th



COMIC ELECTRIC TELEGRAPH.—G. R. SMITH.

strument may be transmitted. As the inventor truly says, the instr would, no doubt, prove an amusing and instructive addition t ornaments of the drawing-room, as it might be used to illustrat principle of magnetic induction.

The action on the eyes and mouth of a comic face is produced by bent iron bars within the figure, which are rendered magnetic by indu and attract either of the features as above, by means of armatures at thereto. In addition to these novel signals, there are also the sig +, , by which not only all the letters of the alphabet are repres but also the end of each word and sentence respectively properly ind These signals are shown by the elevation of shutters above the fac each of the bars is capable of being separately magnetised, either signals can be shown at the will of the manipulator, by touchin corresponding key in front of the figure. The telegraphic alphabet Smith is made up of combinations of lines and crosses, and is the rather of a retrograding character as regards this important bra telegraphy, which has been sadly neglected by most of the inven telegraphs. A bell, used to call attention, is placed inside the figure

MACHINERY AND MECHANICAL CONTRIVANCES.

DICK'S ANTI FRICTION PRESSES.

[A]ONG the contributions from the United States, were six anti friction presses, the invention of David Dick; a baling or packing press, a [. . .]r plate punch for hand work, a machine for bending or straightening [. . .]oad iron, a large boiler plate shears, and an embossing press. The two [. . .]r, with several other American machines, were placed in the western [. . .]ion of the English machinery department, for the purpose of being [. . .]ced by steam power. The novelty and simplicity of these machines, [. . .]bined with their great power, are certainly most remarkable. The [. . .]ciple upon which they are constructed consists in the introduction of [. . .]xcentric roller between two sectors, or discs, resting on edges above [. . .]below, and in a true line with the centre roller, or with a circular shaft [. . .]een two excentric sectors, or discs, resting on their edges. They are [. . .]ced by putting the centre roller in motion in the proper direction by a

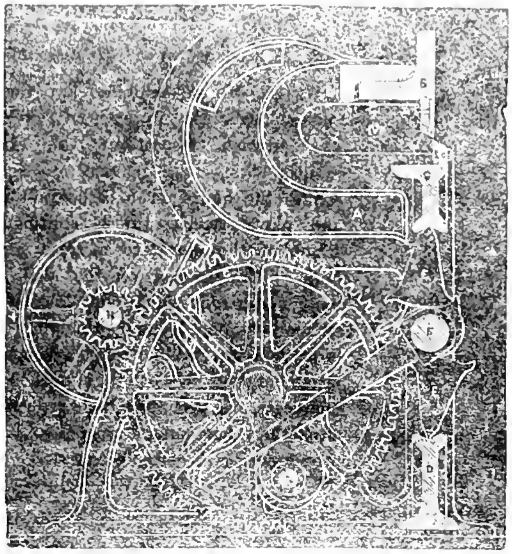


Fig. 1.

[. . .] crank, or pinion, or other arrangement, moved by hand or other [. . .]r. By the movement of this centre roller, motion is communicated [. . .]e piston, equal to the sum of the two excentricities, and with a multi-[. . .]ion of power equal to the greater space through which the applied [. . .]r passes, as compared with the weight moved. There were several [. . .]ications shown of this friction-relieving combination of the lever and [. . .]ed plane, by means of which they may be adapted to all purposes of [. . .]plying power. The proprietors contend that these machines have [. . .]riction than any other known combination of mechanism—not except-[. . .]e hydraulic press—that they are more simple in their construction, [. . .]ss liable to get out of order, and are thus applicable in a great variety [. . .]stances where the introduction of the hydraulic press would be [. . .]ly impracticable.

[. . .]a slight modification of the shape of the excentrics, the power of the [. . .]nes may be varied to suit the nature of the substance to be pressed; [. . .]ey may thus be made available for packing or pressing goods, paper, [. . .]c., in one-third the time usually taken by the hydraulic press, and in [. . .]nth of the time required by the ordinary screw press. The machines [. . .]s also the great recommendation that, for all ordinary work they [. . .]be constructed much cheaper than any other mechanism that can [. . .]ly be made to accomplish the same results in the same time by the [. . .]pplied power.

[. . .] proof of the power obtained by this simple arrangement, we may [. . .]hat, by means of it, a boy can punch cold plates of iron an inch in [. . .]ess with the most perfect ease. A machine, constructed upon the [. . .]principle, for hoisting the piles of the coffer-dam at the Navy-yard, [. . .]York, though weighing only 35 cwt., exerted the force of 680 tons [. . .] power, when worked by four men. A modification of the principle [. . .]so been most successfully applied in a shearing machine for the [. . .]g of $\frac{3}{8}$ inch cold iron plates.

We have seen numerous testimon[. . .] [illegible] pre[. . .] in the States, and from editors of mechanical journ[. . .] [illegible] diploma[. . .], medals, &c., all speaking in the highest term[. . .] of the [. . .] of the invention, and the results produced by the machin[. . .] [illegible] warrant a reliance on the testimony adduced in their favour. Mr. Dick has been awarded a Council Medal for his inventions.

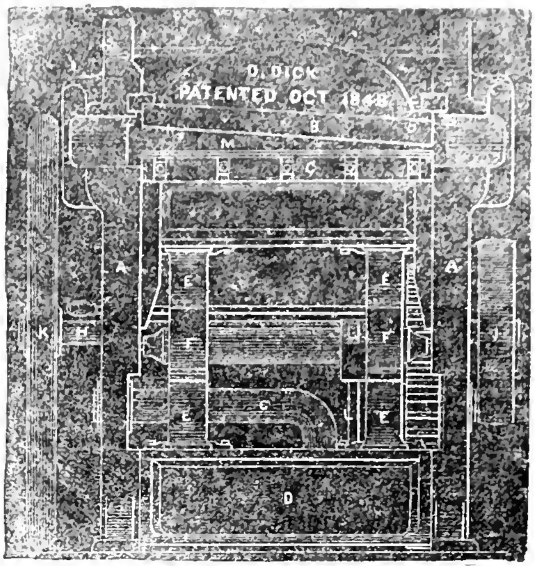


Fig. 2.

Figures 1 and 2 represent front and side views of a Boiler Plate Shears. The same letters in each cut refer to the same parts.

A A represent the side framework of the shear, or press; B B and C C, the blades of the shear, three feet in length; D D, the base, or lower beam; E E E E, four sectors, resting on attenuated scale beam edges; F, the centre excentric roller; G G, a cam crank, working the lever wheel L, through the spear wheel O, and pinion wheel shaft H. The back space of the blades M is large enough to allow long sheets to be split in their centre; while sheets of any length may be cut in any direction, if not exceeding three feet wide. Motion being communicated to the centre wheel F, the sectors are carried in opposite directions, and the gate, or slide, to which the blade C is attached, is moved upwards the sum of the increasing diameter of the centre wheel. A suitable feeding table may be attached, and sheets of any length cut with the greatest accuracy.

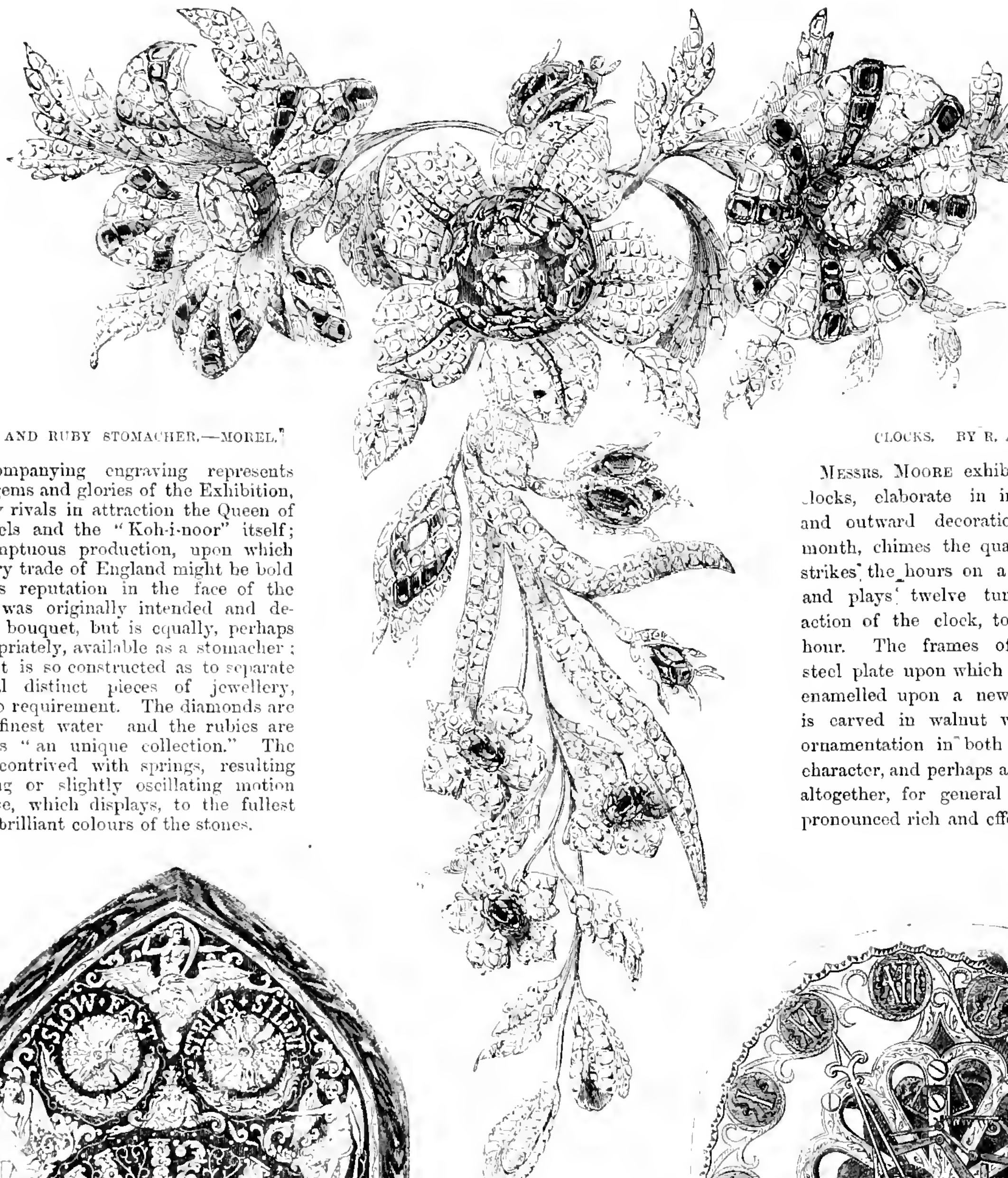
JUDKINS'S HEALD MACHINE.

MR. JUDKINS, the inventor and patentee of this useful machine, formerly lived at Lowell, Massachusetts, U. S. but has now taken up his residence at Manchester, in which important town his machine will no doubt be duly appreciated. By this machine, the yarn is doubled and twisted from single of itself, and at certain intervals is braided or plaited, so that the eye or loop of the heddle is formed without knots of any description, the whole forming one continuous line or cord.

The bed-plate is placed horizontally between the ends of the light-iron frame; on each side of the bed-plate, and let in flush with its upper surface, are ten revolving tables, each table having six slots, the use of which is to receive the spindles carrying the flyers and bobbins. The tables work together in pairs, and each carries three spindles, which are so set in relation to each other, that each spindle, at proper intervals, comes opposite to the vacant slot in the other table. After being twisted the yarn is taken up from the bobbins, after undergoing the process of twisting so as to be converted into a heddle, by two cylinders, one on either side of the machine. The working shaft of the machine is connected with the revolving tables by means of bevelled wheels working underneath the bed-plate.

The machine acts as a doubling and twisting machine, except at the time when the eye or loop of the heddle is formed, when at the top and bottom of each loop it becomes a braiding machine. The bobbins, during the operation, pass from one table to another throughout the whole series in a most ingenious manner. In order to show the advantage of this machine over the ordinary mode of making healds, it is only necessary to state, that from 25 to 30 sets may be produced by it in one working day, with the attendance of one girl, who, by hand, could only make a single set in the same time.

DIAMOND AND RUBY STOMACHER.—BY MOREL.

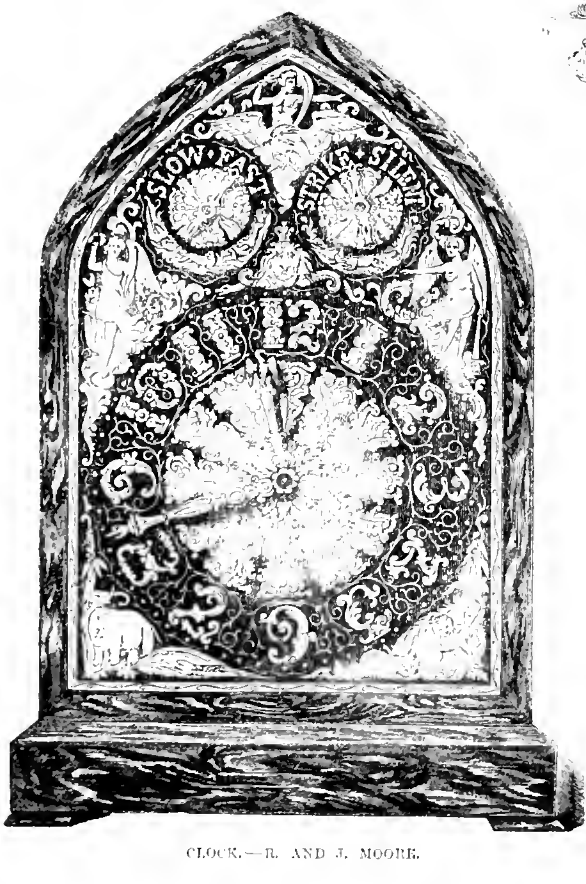


DIAMOND AND RUBY STOMACHER.—MOREL.

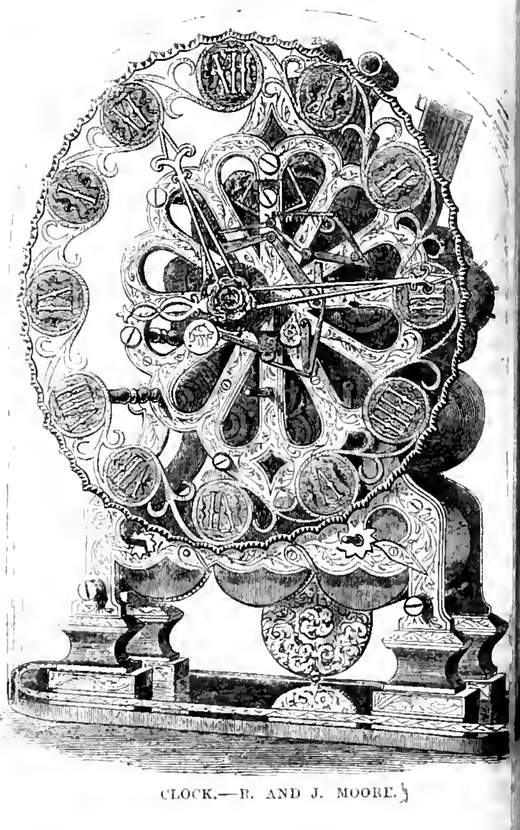
The accompanying engraving represents one of the gems and glories of the Exhibition, which fairly rivals in attraction the Queen of Spain's jewels and the "Koh-i-noor" itself; a truly sumptuous production, upon which the jewellery trade of England might be bold to stake its reputation in the face of the world. It was originally intended and designed as a bouquet, but is equally, perhaps more appropriately, available as a stomacher; moreover, it is so constructed as to separate into several distinct pieces of jewellery, according to requirement. The diamonds are all of the finest water and the rubies are described as "an unique collection." The setting is contrived with springs, resulting in a waving or slightly oscillating motion when in use, which displays, to the fullest extent, the brilliant colours of the stones.

CLOCKS. BY R. AND J. MOORE.

Messrs. Moore exhibited two very sho clocks, elaborate in internal workmansl and outward decoration. One goes fo month, chimes the quarters on eight be strikes the hours on a cathedral-toned b and plays twelve tunes, shifting, by action of the clock, to a fresh tune ev hour. The frames of the dial and steel plate upon which the clock stands, enamelled upon a new principle. The b is carved in walnut wood. The design ornamentation in both is of rather a mi character, and perhaps a little redundant; altogether, for general purposes, it may pronounced rich and effective.



CLOCK.—R. AND J. MOORE.



CLOCK.—R. AND J. MOORE.

The
CRYSTAL PALACE
AND ITS CONTENTS.
AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

GROUP OF SCULPTURED VASES, FROM MALTA.

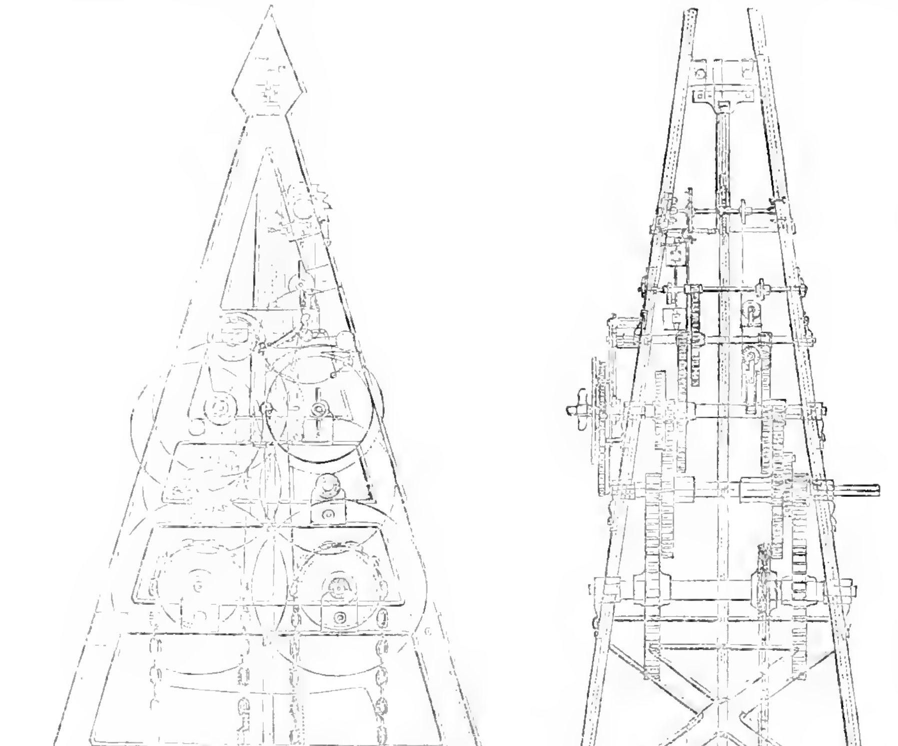
Maltese stone is of a rich cream white colour, and, being soft, is carved. It is, however, not susceptible of polish, and would soon to the influence of moisture. It is, therefore, not available for al decoration; but for hall ornaments, such as vases, jugs, pedestals, is extremely well adapted. The carvers of Valetta have long been ated for their works in this line, and in the recent Exhibition made a very handsome show. The forms were in various styles, chiefly after the antique, and the ornaments comprised satyrs' heads, vine leaves, flowers, &c., all admirably executed. The objects which we engrave are severally by F. Testa, S. Testa, and De Cesare, evincing elegance and variety of design, and softness and delicacy of finish.

HOROLOGICAL DEPARTMENT.

TURRET AND OTHER LARGE CLOCKS.

AS our present article is not designed solely for the information of those who are already well acquainted with the leading features of the construction of horological instruments, we shall probably render the subsequent details more generally intelligible to our readers if we briefly explain some of the technical terms which must of necessity constantly recur in our descriptions, such as *escapement, compensation, remontoire*, &c.

By the term *escapement* is meant that portion of the mechanism of a clock or watch, by which the teeth of the last revolving wheel of the train of wheels, commonly called the "scape-wheel," communicate an alternating motion to the balance or pendulum, as the case may be—and by which also the teeth are successively permitted to escape, after giving an impulse to the balance or pendulum.



THE ALPHA CLOCK.—ROBERTS.

An escapement is called a *detached escapement* when the piece or part that permits the escape of the teeth of the scape-wheel is not attached to the balance or pendulum, but is moved or acted upon by either of these, at some particular point of their swing or *oscillation*. The ordinary clock escapements are the dead beat, and the common or recoil escapements, neither of which is detached. The effect of the recoil escapement will be most easily recognised, in any common clock that has a seconds hand, by a backward jerking motion of that hand; and this is also visible in the minute hand, previous to each advance. It is owing to the form of the pallets and teeth of the scape-wheel, which is necessary for rough work. In the dead beat escapement, no such recoil is observed, but the hand remains stationary between its successive forward movements. This, therefore, is a more delicate escapement, and much more easily deranged than the recoil. Another which is frequently met with in the clocks exhibited, is known as the "pin escapement."

The principal kinds of timepieces which have a balance, and not a pendulum, are watches, carriage timepieces, marine and pocket chronometers; all these are required to keep time under sudden and various changes of position—disturbing causes which are incompatible with the free motion of a pendulum.

The more usual escapements applied to this class of timepieces are (we arrange them in the order of merit) the chronometer, the duplex, the cylinder, the lever, and the verge or common vertical escapement: of these the chronometer and the lever are the only detached ones.

A very neatly finished series of models of watch escapements exhibited by Bryson, of Edinburgh, and a series of skeleton timepie exhibiting the various escapements, by Roskell, of Liverpool. There another well executed series of models by S Kralik, of Pesth, in Austrian department. This series comprised the chronometer escapeme the duplex—in this the points of the teeth of a second and smaller sc wheel perform the office of the usual pins; the lever—in this the te are terminated by oblique surfaces, instead of being pointed as usual arrangement which probably wears better, but the friction must be great the cylinder, and a modification of this—in which a curved tooth on balance axis performs the office of the cylinder.

There was also a model of the pin escapement applied to a balance, of two unusual vertical escapements. In one, the scape-wheel is like t of a common recoil escapement. There are two circular plates on balance axis, with a notch in each. A tooth of the scape-wheel, in pass the notch in the first plate, gave an impulse in one direction to the bala and fell on the second; on the recoil of the balance the tooth is rele from the notch in the second plate, and in passing gives an impulse to balance in a direction opposite to the former. In other there are two scape-wheels, at a small dist from each other, on the same axis, the teeth of w are placed intermediately to each other. Ther a cross bar on the balance axis which release tooth of the two scape-wheels alternately, an passing receives an impulse from each.

By the term *compensation* is meant the actio some mechanism by means of which the balanc pendulum of a timepiece is made to oscillate in nearly the same time, notwithstanding consider changes of temperature. As the physical causes w influence the time of oscillation of a balance are in essentially different from those that affect the dulum, we shall leave the question of compensa in balances until, in a subsequent article, we giv account of the construction of the various marine pocket chronometers which were presented to notice in the Exhibition: and for the present we confine our attention to the compensation of pe lums. The time of oscillation of a pendulum pends, not on its entire length, but on the distanc tween the point of suspension and a point called centre of oscillation—the point at which, if the w weight of the pendulum were concentrated, it w still oscillate in exactly the same time. The m matical considerations of this point need not her entertained, as they may be found in any stan work on dynamics; we need only further ren that the *greater* the distance between these poir the centres of suspension and oscillation—the *s* will be the oscillation of the pendulum, and *vice v*

If a pendulum be not compensated, the least v ble material of which it can be made is a rod of tolerably light and porous wood, as deal or Hond mahogany, the length of which is very slightly affe by changes of temperature and moisture; but small changes produced by these agents cannot readily be distinguished from each other. If, ever, as is more frequently the case, the rod of a dulum is of metal (usually iron or steel), it is evi that the weight at the end of the pendulum wi carried further from the centre of suspension b pansion of the rod when the temperature rises- again brought nearer when the temperature fall all metals expand by heat, and contract by cold, though in very diffe degrees.

If, then, to the lower end of the pendulum is attached a certain po of some metal that expands by heat much more rapidly than steel centre of gravity of the added or *compensating* metal may be carried upw by its own expansion, sufficiently to counteract the descent of the cent gravity of the remaining portion of the pendulum by the expansion of steel rod; and thus an invariable distance may be maintained betwee centres of suspension and oscillation under all ordinary variation temperature.

One of the oldest forms of compensation consists of a series of brass steel rods placed alternately, and the adjacent rods connected altern at the top and bottom, the weight being attached to the outer pair of rods. In this arrangement, to which, on account of its shape, the nan "gridiron pendulum" was given, the excess of expansion of the brass is sufficient to compensate the expansion of the whole length of the pendu

In clocks of the best description, such as astronomical clocks "regulators," the compensation is usually effected by means of a gla iron cistern of mercury, attached to the bottom of a steel rod, w supplies the place of the ordinary weight. Owing to the very l expansion of mercury, which is much greater than that of any other m a column of about eight or nine inches high is sufficient to compensat its expansion for the whole length of an ordinary seconds pendulum.

In the turret clock exhibited by Dent, the compensation is effe

a hollow cylinder of zinc, which surrounds the rod of the pendulum; in several of the French clocks, by a brass rod placed between two el ones. The brass rod, by its expansion, raises the steel ones and the ght, or the weight only, through a space sufficient to compensate for the ansion of the steel rods; this is effected by means of two levers, which placed either at the top or bottom of the rod, but more frequently latter.

ome other special modes of compensation must be mentioned hereafter, speaking of the clocks to which they are applied.

ut there is yet another important source of error in the rates of clocks, e particularly affecting those of large clocks. To obviate this, a mechal arrangement has been devised, which is known by the term *remontoire*. locks of large size the irregular action of the coarse teeth of large els, and the ever-varying weight of the portion of the rope by which clock weight is suspended, that is brought into action, as it is uncoiled n the barrel, are perpetual sources of irregularity in the impulse given he scape-wheel to the pendulum. In the best description of turret ks these sources of error are now obviated by disconnecting the scapeel from the train, which, when released at short intervals, (usually of a minute) raises a small weight or lever, which in its descent communtes to the pendulum, through the medium of the scape-wheel, either orm impulses, or a series of impulses varying very slightly, but recurring formly at each descent of the weight or lever. This, from its being odically raised up, has been termed *remontoire*. The various mechanical ngements applied to the clocks exhibited will be more appropriately ribed when we speak of them individually.

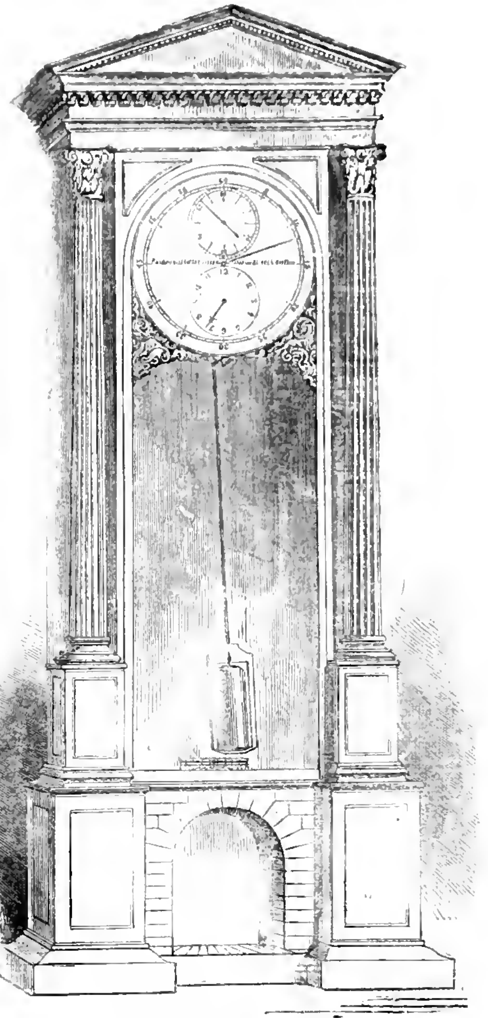
aving thus briefly described the leading features that characterise the struction of first-class clocks, we will now proceed to notice the large urret clocks that were presented to us in the Exhibition. The English artment contained, it must be confessed, but a small amount of variety. the right of the great organ was a large turret clock, called the Alpha k, by Mr. R. Roberts of Manchester, which unquestionably presents a nger evidence of original genius than any other clock in the Exhibi-; there is, in fact, nothing about it at all that is common-place. The e is of a quadrangular pyramidal form, which is admirably adapted solidity; the large wheels being placed near the base of the pyramid, the smaller parts above them. The teeth of the wheels and pinions all cast, except those of the scape-wheel; this must, of course, influence siderably the cheapness of construction. The escapement is detached, of a novel construction; there is a detent with two arms, on an axis ch has also a pinion in gear with a wheel on the same axis with the e-wheel, so that the detent axis makes half a turn to release each tooth e scape-wheel. The detent is held by a tooth at the end of an arm hangs from the point of suspension of the pendulum; this arm is ed by a pin projecting from the pendulum near the end of its llation, and releases the detent, when the pendulum receives an impulse n an oblique surface of a tooth of the scape-wheel. The scape-wheel pelled by a remontoire of perfectly uniform action; this consists of a ght attached to an endless chain, which is wound up every half minute, he release of the train, by the arm of another two-armed detent. The k weights themselves also form part of an endless chain; but this s to be an unnecessary refinement. The construction of the hammer which the bell is struck is also quite new. The head of the hammer is ll of gutta percha by which the tone of the bell is at once brought out, mpeded by the secondary vibrations that result from the blow of an nary metallic hammer. Again, the fly is superseded, and the hammer made to perform the office of a fly. It revolves at right angles to an , and, in making one revolution, acquires sufficient centrifugal force to w the head outwards, and enable it to reach the bell; after striking, hammer remains quiescent.

ear the end of the south-west gallery, was exhibited an accessory to et clocks that deserves notice. This was a simple and ingenious mode elf-regulating the supply of gas to illuminated dials, by Mr. J. Blaylock, length of time being daily increased or decreased by the mechanism, required. The action requires to be reversed on the longest and rtest days.

n the western avenue was a turret clock by Mr. Dent. In this the n is released by a detent every half minute, and winds up a spring tained in a box through which the scape-wheel axis passes. The end of spring is attached to the axis, and consequently the spring acts as a ontoire. As the object of a remontoire is to obtain uniformity of ulse on the pendulum, this, of all the contrivances exhibited, appears least calculated to attain the desired object, owing to the variation in strength of the spring from change of temperature; especially when remember that turret clocks are, from their situation, exposed to great ssitudes of temperature.

n the French department, M. Gourdin exhibited a beautifully finished ce of workmanship, but greatly wanting in solidity. Two ornamented n-work girders, on which the whole weight of the clock rests, was lently bent by the weight that they were unduly called on to sustain. remontoire consists of a weight hanging by a thread from an arc at end of a lever; this renders the action of the weight constant, but the on is not entirely constant, as the short arm of the lever carries an s on which are two wheels—one in gear with the train, the other with scape-wheel pinion; the escapement is a dead beat, the teeth of the scapeel being obliquely truncated.

I. Bailly-Compte showed a well-finished clock, with a pin escapement. The remontoire gear is one of which there were several examples amongst the French clocks. The last axis in the train, and the scape-wheel axis are in a line with each other, and have two bevelled wheels of equal size at their adjacent ends, which are separated by an interval equal to the diameter of the wheels. The remontoire, which consists of a lever with a weight near the end of it, has a bevelled wheel attached to it at right angles to, and in gear with, the two former bevelled wheels. Thus the train, which is periodically released raises the weight that in its descent impels the scape-wheel. This appears to us, on the whole, the best arrangement of the remontoire. Some little irregularity would of course arise from the variation of the length of the lever by temperature, but we doubt whether this would be sensible in the rate of the clock, and if sensible, it might be very easily compensated.

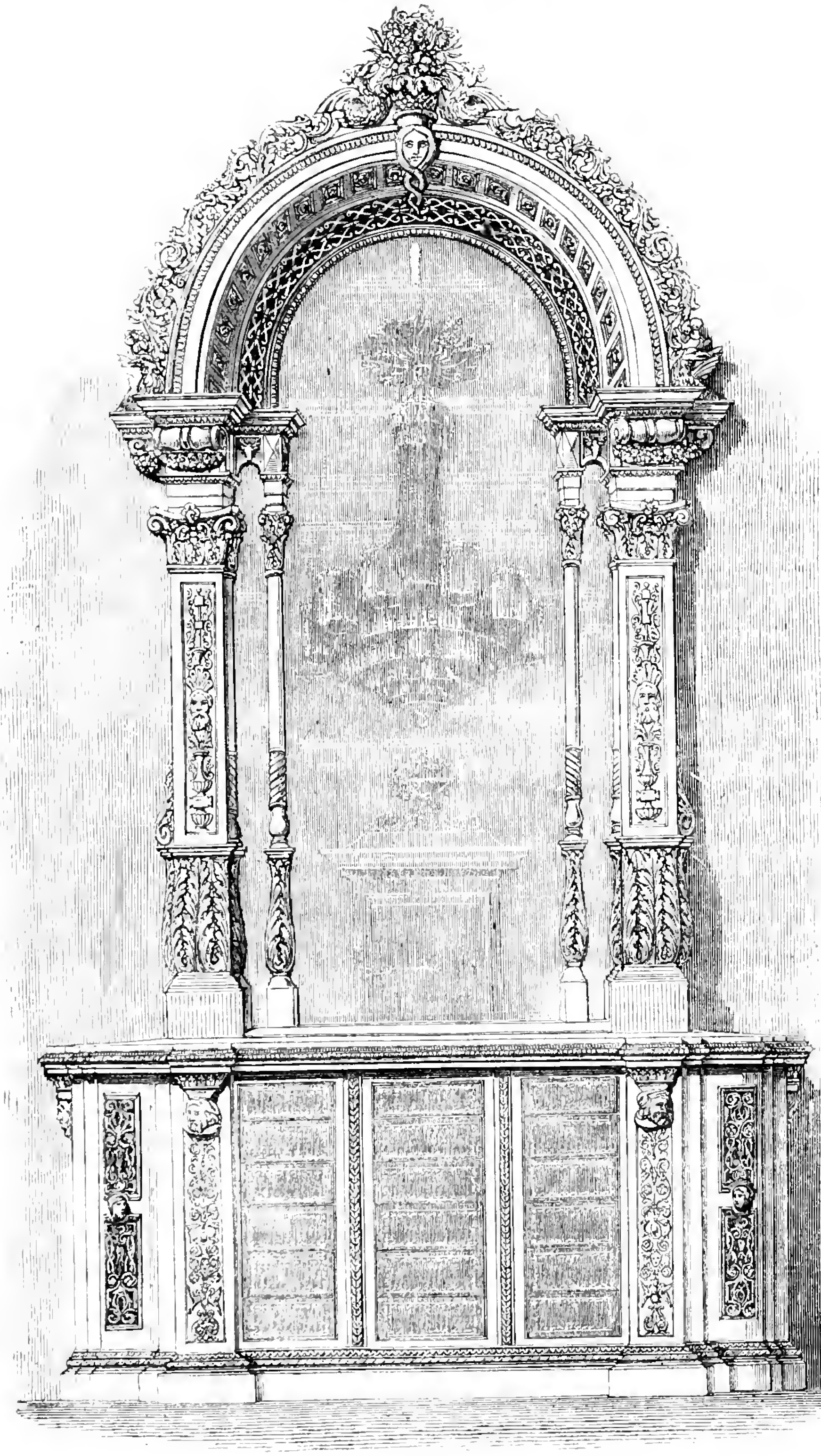


CLOCK.—FRODSHAM.

The series of clocks by M. Wagner, of Paris, were entitled collectively to more study than the works of any other exhibitor. No 3, a striking clock, with pin escapement. No. 7 exhibited a novel detached escapement; two jewelled pallets at the ends of short-balanced levers are attached to the pendulum, one above and another below the circumference of the scape-wheel, the axis of which passes through a space cut out of the pendulum. We should suppose the action to be very light, and to have little friction. The next article was a clock with pin escapement, and pallets attached to the pendulum. The remontoire is a weighted lever, which when down, releases a fly, that prevents the weight being raised by a jerk. This, no doubt, would interfere with the sudden jumps of the minute hand, as in Dent's clock: but this advantage we think may very well be sacrificed to the steadiness and uniformity of the movement. An endless-screw on the axis of the fly, and a pinion with oblique leaves, are both in gear with a wheel having oblique teeth on the barrel axis. This clock had few wheels, and its construction appeared very simple. There was also deserving of notice a clock with pin escapement and bevelled wheel remontoire, kept wound up by the continuous motion of the train regulated by a fly, to which a cap, suspended to the short arm of the remontoire lever, acts as a governor. This is a very ingenious contrivance, by which the continuous motion of the train is rendered isochronous with

the alternate motion of the pendulum, and may therefore be used to carry an equatorial movement, or a heliostat, or for any other purpose for which a perfectly uniform continuous motion is required.

A highly finished clock, with detached pin escapement, compensated pendulum, and bevelled wheel remontoire also deserved notice. The impulse here is given to the pendulum by a detached bar, the ends of which are alternately raised by two arms fixed on the axis which carries the pallets. Any sudden motion of the remontoire is prevented by a fl The pendulum is compensated by the brass bar between two of steel, an levers as previously described. There was lastly a clock with a pin escap ment—the remontoire and the pendulum the same as the preceding. Th pallets are attached to the pendulum, but the friction of the pins on tl horizontal surfaces of the pallets is very ingeniously prevented by the being received on pieces projecting from two arms moving on the sam centre as the pendulum, and on which they res until they are delivered on to the inclined surfac of the pallets. This appears to be a great improv ment on the ordinary pin escapement, and w worthy the attention of our clock-makers.



SECRETAIRE.—SNELL.

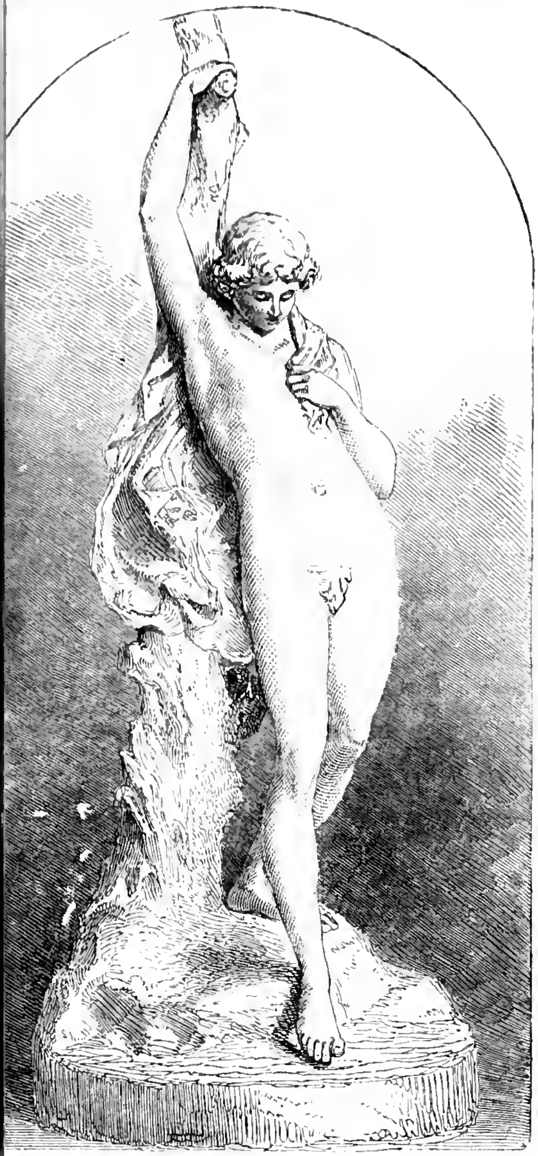
The Secretaire exhibited by Snell is a very handsome work of art. The form is well proportioned, and all the decorations in good taste. The chief material is walnut-wood, the inner pillars being gilt, and the basement of green stamped leather. In the door is a handsome mirror.

TEXTILE MANUFACTURES.

COTTON, DYEING, AND CALICO PRINTIN
No. I.

On entering the noble transept of the Exhibiti for the first time, the visitor was struck w admiration at the gorgeous spectacle presented him. The groups of statuary, the crystal fo tain with its many-hued refractions, the brillia coloured objects projected upon the delicat tinted back-ground produced by the blending the three primary colours so judiciously emplo by Mr. Owen Jones for the decoration of building—all contributed to form the most l monious combination of colour that art has e realised. The articles displayed seemed at f only subsidiary, and were merely regarded a many masses of colour which together formed single picture. It was only when the eye bec familiar with the scene, that it perceived that e of the coloured spots which aid in the format of the whole was itself a noble work of art, collection of such works—it may be the represe tive of one entire branch of manufactures. T the brilliant mass upon which the eye had re for a moment after leaving the sparkling foun of Osler, was a trophy of silks, the produc the looms of Spitalfields. It contained many b tiful specimens of manufacture, each in its triumph of art. The speck of colour in the gal above was a superb carpet, the loyal homage of ladies. An examination of the more distant t brought us acquainted with the gay-colo woollen cloths produced by Leeds and the V of England for the Chinese and Russian tr and the more sombre, but equally rich, hues w the same manufacturers offer to their English tomers. In the same direction we saw the p and brocaded poplins of Dublin, and the i merable tints of the printed goods of Manche On the opposite side of the transept we had gay printed cottons of Alsace, the printed woc Paris, the silks of China, the velvets of Genoa,

From a general examination of these group may pass to a consideration of the individual cles which compose them. We may admire texture of the fabric—the finish—how the of the designer contributes to render the ar beautiful—and how brilliant are the colours w embody the design. That examination is, how a very superficial one which rests here. With a slight acquaintance with the processes of m facture, what a host of reflections crowd upc in the contemplation of a single work of What an amount of knowledge, of skill, of hu toil is embodied in each separate production. say nothing of the material, and of the machi employed in its preparation, spinning and wea —what labour has been spent upon the tin the pattern alone. The deep blue is prod from indigo, a substance manufactured from leaves of a plant cultivated in Hindostan. V out reference to the skill and capital req for the culture of the plant, or to the diffic and dangers of the manufacture, its transit has required a voyage of nearly six month bring it within reach of the dyer. The more brilliant but less stable by its side is obtained from animal offal, cuttings of hoof and horn, refuse of the slaughter-house and the shoeing forge. The greens are a bination of the blues with a yellow wood from Cuba, or a bark from N



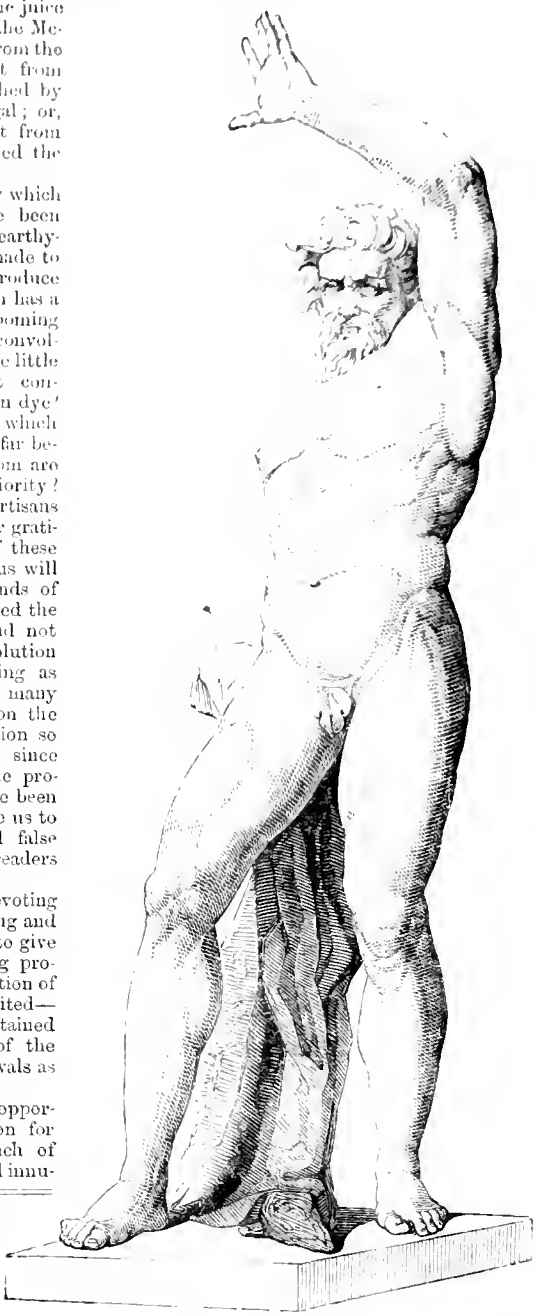
YOUTH AT A STREAM.—FOLEY.

America, or, it may be, with the juice of berries from the shores of the Mediterranean. The crimson is from the bruised body of a little insect from Mexico, or perhaps it is furnished by the petals of flowers from Bengal; or, if the fabric be cotton, a root from Turkey or Provence has yielded the dye.

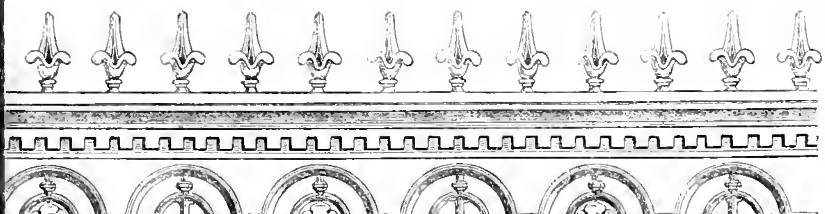
But what are the processes by which these surprising results have been obtained? How can the blue earthy-looking substance, indigo, be made to unite with the fibre, and to produce so rich a stain? What relation has a piece of horn or hoof to the blooming colour upon the petals of the convolvulus in the pattern? How is the little down-covered Mexican insect converted into the brilliant crimson dye? How is it that the countries which yield us these dyes are yet so far behind us in their use? To whom are we indebted for our superiority? What is the condition of the artisans employed in ministering to our gratification by the production of these brilliant hues? These questions will suggest themselves to thousands of inquiring minds, who have visited the Exhibition for instruction, and not for mere amusement. Their solution cannot fail to prove interesting as well as instructive; while, to many of those who merely look upon the surface of things, the information so conveyed must prove useful, since even a slight knowledge of the processes by which the colours have been produced will frequently enable us to distinguish between true and false dyes—a problem which our fair readers are daily called upon to solve.

We therefore propose, in devoting a series of articles to the dyeing and printing of the textile fabrics, to give a description of the interesting processes employed for the production of the more striking articles exhibited—of the steps by which we have attained our present excellence—and of the comparative progress of our rivals as shown by their productions.

There never existed such an opportunity as during the Exhibition for studying this interesting branch of art. Under the same roof we had innu-



CAIN.—JEHOTTE.



RAILING FOR A TOMB.—THE COLEBROOK DALE COMPANY.

ENGRAVINGS ON THIS PAGE.

The statue of a "Youth at a Stream" is an original and not ungraceful design, and was admirably executed in bronze by the Colebrook Dale Company.

The "Cain," by Jehotte, is a spirited attempt, in plaster, after the school of Michelangelo,—but crudely wrought out. The Catalogue states that the first murderer is supposed to be exclaiming, "My punishment is greater than I can bear;" but for this, the attitude is inappropriate. It would suit better for the first impulse of horror on seeing the dead body of his brother.

The original of the "Railing for a Tomb," by the Colebrook Dale Company, was designed and erected for that of the celebrated Beckford, author of "Vathek," at Bath. It is of a simple and elegant character, standing about two feet and a half high. This casting affords one of many gratifying examples of the progress made by this country within the last few years in this important and elegant branch of decorative art.

merable specimens of the dyes employed, showing the difference of their appearance and quality when produced from different sources. We had all the chemicals which the dyer employs for fixing or brightening his colours, and in many cases models of the apparatus, or illustrative specimens, to show the processes by which these important articles have been produced. In the south-west gallery we had a series of dyes prepared for use, and by their side a series of porcelain slabs to show the re-action of these dyes with the more important chemicals. The Messrs. Black, of Glasgow, in addition to their very beautiful collection of printed goods, had prepared an elaborate series of specimens for illustrating nearly every style of calico printing. We were first shown the grey or unbleached cloth—next the cloth bleached and prepared for printing—and subsequently a specimen of the same fabric in each stage of the many processes through which it has to pass before the design is fixed in the perfect colours. Mr. Hammersley, of the Manchester School of Design, exhibited a valuable collection of patterns of Manchester prints, which illustrated in a striking manner the progress of calico-printing in England from an early period of the art. To render the history of the art complete, we had also the printed goods from India and the Indian Archipelago, where it had its origin. The Malays, after having advanced to a certain point, appear to have remained there for many centuries, for it is certain that the processes now in use are identical with those described by the elder Pliny. We can thus contemplate the art in its cradle; and passing from this point to the study of the finished productions of the Hargreaves, the Koechlins, and the Godefroys, we may embrace at a glance the progress which the genius and skill of the European manufacturers have effected.

Calico-printing by blocks is an early invention, as we find it regulated by act of Parliament in 1720, and again in 1736. The art of printing by cylinder machine was introduced in the year 1785 by Mr. Bell. The pattern is engraved by etching or any other process on the surface of the cylinder, and, a certain amount of colour being applied to the surface, the redundant quantity is scraped off by the "ductor"—a blade made of sheet steel. The colour remaining is brought in contact with the fabric to be printed as the rollers revolve rapidly, and imparts the desired pattern. A separate roller is required for each colour, and five or six, or even more, rollers may be used in the same machine: the piece of calico to be dyed passing consecutively over each roller, and being then dried by steam boxes placed so as to impart their heat to the fabric. The process of engraving copper rollers for the purpose of calico-printing was still further improved about the year 1808, by Mr. Joseph Lockett and others. Small steel cylinders are engraved with the pattern desired, and are then hardened, and the pattern is transferred by pressing the steel and copper rollers firmly together whilst they both revolve.

MACKENZIE'S PATENT JACQUARD READING-FRAME.

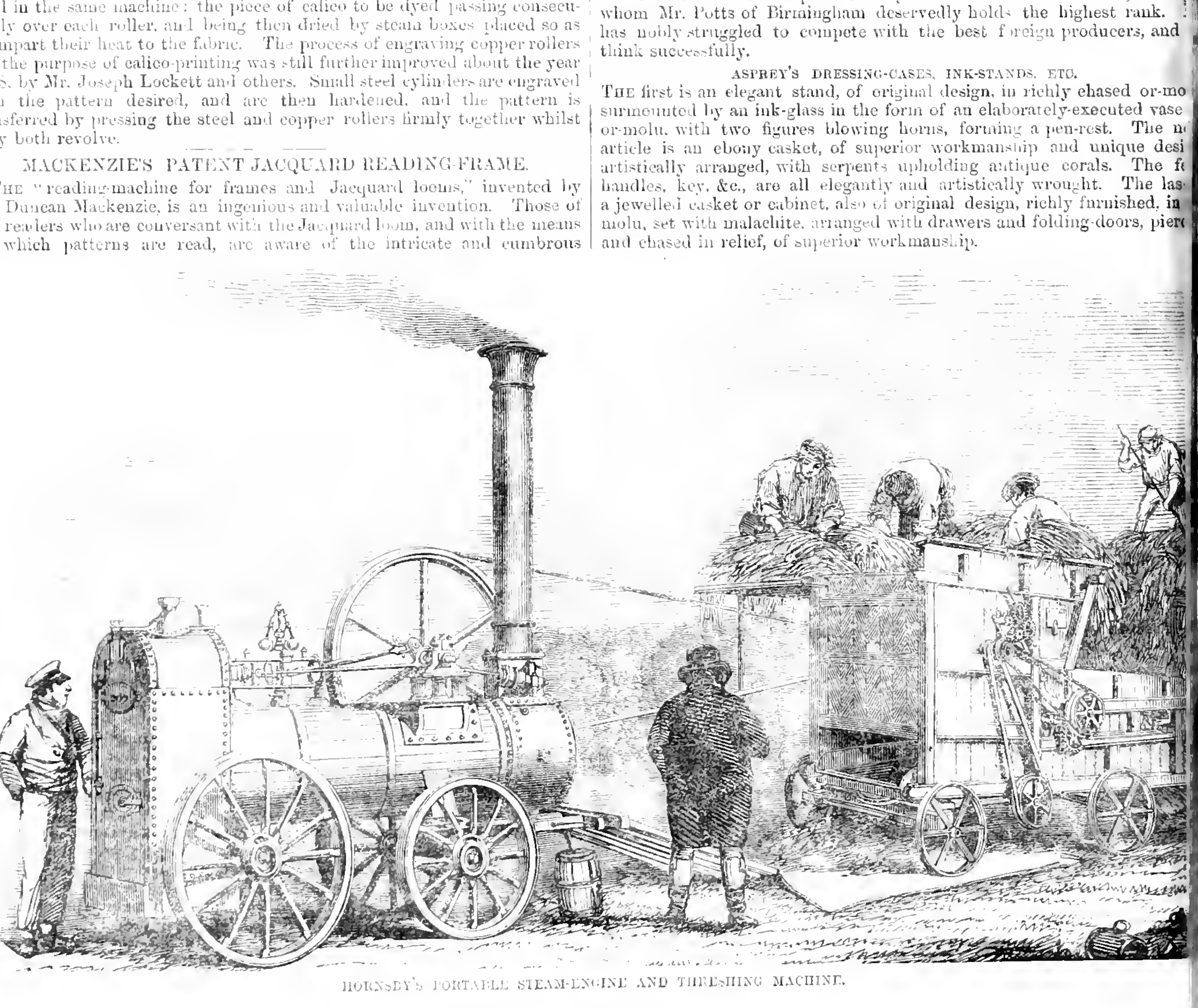
THE "reading-machine for frames and Jacquard looms," invented by Mr. Duncan Mackenzie, is an ingenious and valuable invention. Those of our readers who are conversant with the Jacquard loom, and with the means by which patterns are read, are aware of the intricate and cumbrous character of the apparatus at present employed, and which requires a lon period of training to enable a person to understand it. By means of th machine, however, a boy, or any other person of ordinary capacity an attention, may learn to "read," "cut," or "repeat" the design, in a fe hours; while one boy can accomplish more in the same space of time tha is now performed by a man and a boy—the operation being similar to th of playing the pianoforte, or any other keyed instrument. The machi itself consists of an upright frame, with perforated plates at the upper pa of the front, which contain the punches for perforating the cards. number of bell crank levers, working upon axes, are fitted at one end keys placed in the lower part of the machine, similar to those upon piano. These keys are numbered to correspond with a graduated scale "sight plate," immediately above them, representing the squares or "cords to be read in from the design or pattern. The other end of the levers ac upon needles at the back of the plates in the upper part of the machin which force the "punches" from the stock plate into the "receiving" centre plate, in the exact position required for forming the patterns. A therefore, that is required, in order to read in any pattern, is for the pers working the machine to press down such keys as will force out the punch corresponding to the squares or cords indicated on the pattern by the grad ated scale before him. When the whole of the punches corresponding to t squares have been placed in the receiving plate—which may be a 480, 600, or any other number—the perforation of the "lash cards" is perform by means of an excentric shaft or rod, by which the punches in the receivi plate are forced back, and produce the required perforation. The machi is also provided with cutting knives for cutting the cards to any requir size; and from its value in facilitating labour, economising expense, a reducing to mathematical exactness operations which have hitherto be matter of uncertainty, it is well worthy the consideration of all perso interested in those branches of manufacture in which the Jacquard employed.

WORKS IN OR-MOLU.—BY POTTS.

THE little clock-case and flower-stand in ormolu engraved at page 284, agreeable specimens of the taste and workmanlike finish displayed in the exhibits in this department by our native manufacturers, amon whom Mr. Potts of Birmingham deservedly holds the highest rank. has nobly struggled to compete with the best foreign producers, and think successfully.

ASPREY'S DRESSING-CASES, INK-STANDS, ETC.

THE first is an elegant stand, of original design, in richly chased or-mo surmounted by an ink-glass in the form of an elaborately-executed vase or-molu, with two figures blowing horns, forming a pen-rest. The n article is an ebony casket, of superior workmanship and unique desi artistically arranged, with serpents upholding antique corals. The f handles, key, &c., are all elegantly and artistically wrought. The las a jewelled casket or cabinet, also of original design, richly furnished, in molu, set with malachite, arranged with drawers and folding-doors, pier and chased in relief, of superior workmanship.



HORNSBY'S PORTABLE STEAM-ENGINE AND THRESHING MACHINE.

AGRICULTURAL IMPLEMENTS.

HORNSBY'S PORTABLE STEAM-ENGINE AND THRESHING MACHINE.

has become the practice of many agricultural implement makers to te their whole energy and skill to the perfecting of one or two parti- l implements or machines; hence, we now find one firm celebrated for ghs, another for chaff-cutters, another for drills, &c.; and the excellent ts of this practice are especially observable in the case of the portable n-engine of Messrs. Hornsby.

is eminent firm have paid great attention to the construction of port- steam-engines, and have been the winners of many prizes in contests periority with other makers. Last year, and we believe on a previous ion, they gained the first prize from the Royal Agricultural Society ngland; and they moreover again carried off a Council Medal at the Exhibition of 1851.

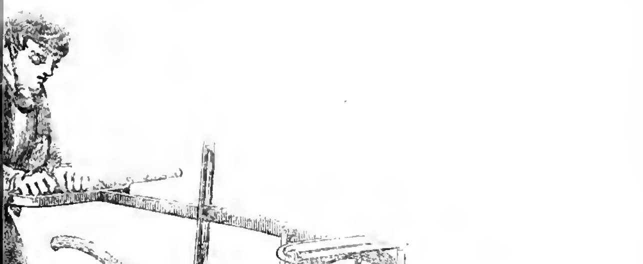
e most remarkable feature in this engine is the placing the cylinder steam chest, where it is kept hot, and all waste of heat prevented; t the same time, it is so arranged that the cylinder may be got at ease when necessary, for repair, &c.

e workmanship of this machine is highly creditable to the Messrs. sby, there having been nothing, perhaps, in this department superior ; and the details exhibit the result of study to produce the best ble result in the best possible manner.

have engraved the engine as it is used in threshing in the open with one of the excellent threshing-machines made by the same

BADDELEY'S FARMER'S FIRE-ENGINE.

e frequent occurrence of fires in the agricultural districts has led ddeley (whose name is well known in connexion with a variety of rs connected with the means of extinguishing and escaping from fires) ign a cheap and efficient engine adapted to the requirements of the r. It is exceedingly portable, as one man may move it from place to



All the working parts are constructed to bear the roughest usage meet with on a farm, and any farm labourer may be taught in a few s how to use it. The valves are of metal, and not liable to derange- but should any obstruction occur, it can be removed instantly t disturbing any of the working parts of the engine. The branch- furnished with a spreader, by means of which the water can be o act over a large surface, which is specially important in the event in corn or hay-ricks, or weather-boarded buildings, &c. Worked by nen, the engine will throw a jet of water between 50 and 60 feet in and, from the great rapidity with which it can be brought up and work, it will be found more efficient in arresting the progress of the an one of more powerful character at an advanced stage of the ration. Not the least part of the advantage to be derived from the e, is the fact, that it will be equally useful as a liquid manure forcing- and for a variety of agricultural purposes, as for the special object nguishing flame. They are constructed for the inventor, by Mr. ether, of Long-acre, which is a guarantee for their excellent work- p and general efficiency.

THE ARTS OF DESIGN AND DECORATION.

STAINED AND PAINTED GLASS.

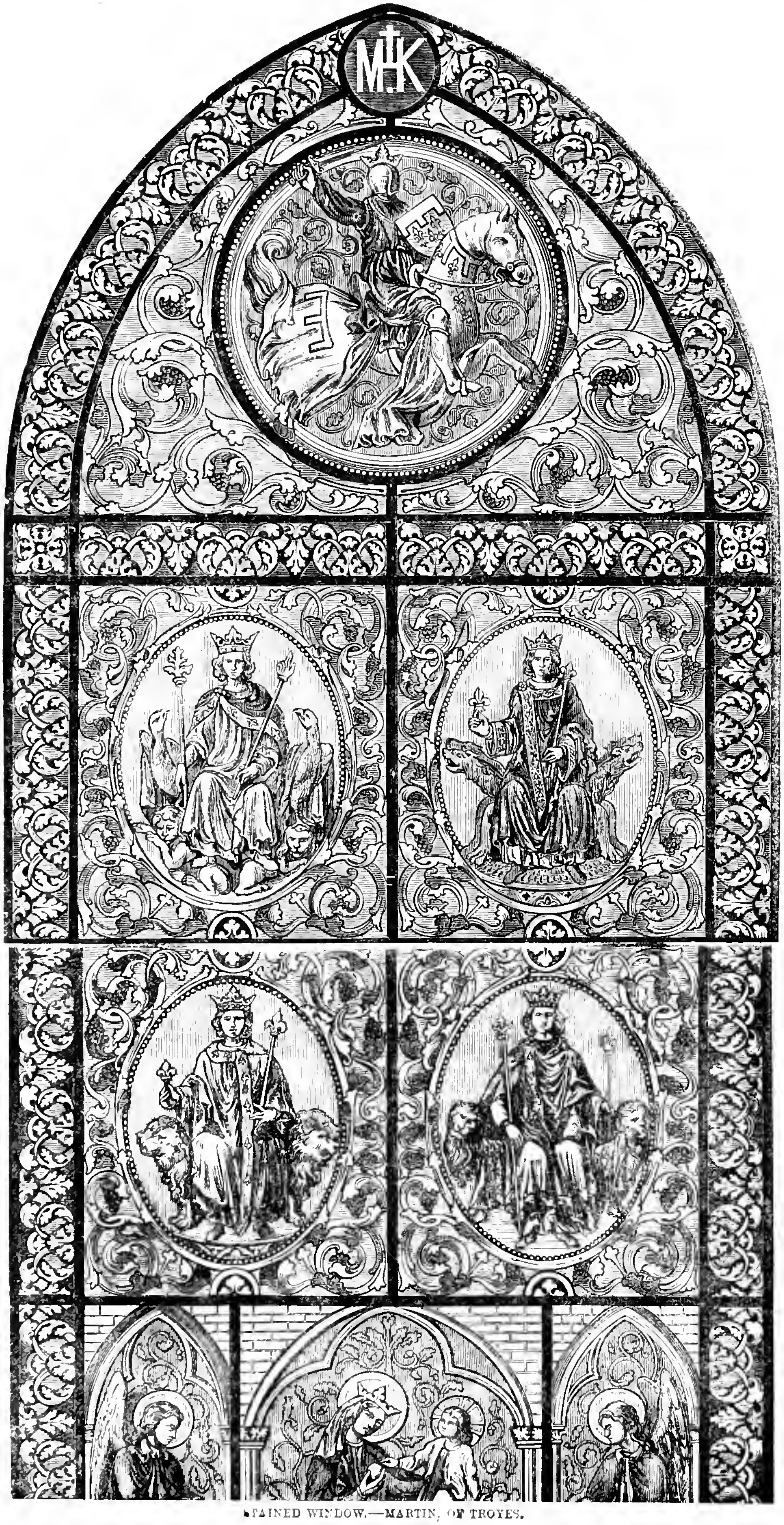
ALTHOUGH the art of staining glass is lost in antiquity, its application to pictorial purposes is comparatively recent. Doubtless the mosaics of the Egyptians and Romans originally suggested the idea of transparent glass pictures; for, indeed, the earliest attempts were entirely composed of small pieces of glass of various colours, united by thin strips of lead, as may still be seen in old churches and cathedrals. The first records of pictorial glass work extant date from about the year 800, in the days of Pope Leo III., when so many magnificent ecclesiastical edifices were erected, commenced, and designed.

Venice was chiefly famous for the manufacture of stained glass, the use of which was brought to high perfection with the pointed style of architecture in England. Fine specimens of the art may be seen in York Minster the collegiate halls and chapels, and especially in the chapel of King's College, Cambridge. It is evident that the art of painting on glass may be divided into two perfectly distinct operations: firstly, the artistic design with reference to the capacities of the materials; secondly, the mechanical or rather chemical preparation and application of the materials themselves. Unlike most other descriptions of painting, in which vegetable as well as mineral colours are freely used, glass requires the exclusive use of mineral colours. The oxides of metals, such as gold, silver, cobalt, &c., are chiefly employed. These colours are, as it were, burnt into the glass. Some of them stain the whole substance, and are quite transparent; others mix with a substance called flux, and vitrify on the surface. These last are more or less opaque or semi transparent, according to the mode in which they are applied.

Now, the ancients being more moderate in their demands on such a means, were more primitive, and perhaps, more successful in their effects, whilst the moderns have progressed in an artistic point of view, but at the expense of the transparency, breadth and simplicity, of their ancestors. As a general rule, the modern paintings on glass are too much paintings in the strict sense of the word, too opaque in their shadows, and, in fact, too much shaded altogether. Whereas, painting on glass, to be really effective, should be almost entirely outline and colour, and as free from non-transparent, that is, *black*, shading as possible, for it must be remembered that all non-transparent colour becomes mere neutral tint when opposed to light in a window, and that the depth of the tint is mainly regulated by its transparency; hence the somewhat muddy character of the majority of modern paintings on glass. Where, however, the nature of the material is sacrificed to real excellence in the design, we are inclined to make great allowances; but, unfortunately, either most manufacturers of stained glass grudge the expense of employing competent artists to draw for them, or artists of merit consider it beneath their dignity, or, lastly, the patrons of the art themselves regard it in too mean a light, and do not offer an adequate remuneration for the production of such painting on glass in their churches, &c., as we should desire to see, and, seeing, to admire.

Yet there are plenty of young artists who would be glad to make coloured designs for glass windows for a very moderate remuneration, and who are perfectly capable of good composition, correct drawing, and judgment in the arrangement and distribution of the colours. Upon those more especially, who, from the spur given to the art by the late Exhibition, may speedily be called on to fulfil the above requirements, we would impress the following suggestions, which we venture, with all humility, to advance for the guidance of adventurers in a new or revived domain of pictorial creation. In the first place, it must be borne in mind that a stained glass window is not a mere painting, but a means of admitting light, modified and tempered, it is true, but still light, into the building to which it pertains. Hence an additional reason for the all-importance of transparency in glass window-pictures. Secondly, it must be remembered that these pictures are generally seen at a considerable distance; therefore, the boldness, breadth, and, above all, the harmony of the effect, is far more vital to its success than any minuteness of detail. Thirdly, it must be invariably present to the mind of the artist, that he is not producing a work for isolated exhibition, but is labouring in combination with the architect of the edifice which his design is to adorn, and with which it is expected to fill in and harmonise—not to jar and contrast by painful and violent uses of light and shadow, such as, we are sorry to say, the late collection very plentifully offered. Actual white and black (that is, opaque shadow) ought to be almost entirely excluded from works of this kind. In a word, the window ought never to lose for an instant its character as a window, that is, an admitter of light, which is its absolute and æsthetic relation to the walls, columns, and domes of the building it illuminates.

It is certain that the practical art of *staining* glass, which flourished in such perfection during the thirteenth century, has been in a great measure lost, and, notwithstanding all the efforts of modern chemistry to equal and surpass it in purity and brilliance of colour, it remains unrivalled. On the other hand, *painting* on glass, when carried out by artists such as form the exceptions to the strictures above made, is decidedly pushed much further than in former times, as far as mere pictorial excellence is concerned. Whether it has advanced in its legitimate mission, that of an harmonious



STAINED WINDOW.—MARTIN, OF TROYES.

adjunct to architectural effect, we doubt. new era has, however, commenced in the and we must take it as we find it, merely sidering its merits with reference to the ol intended to be attained, and not criticisi according to any abstract causes of glass dow-painting, which, right or wrong, may l a part of our artistic conscience.

In proceeding to notice the works in thi partment displayed in the Great Exhibition would premise that we are not amongst devotees to this mode of decoration as a vel for high Art; and consequently, must be pared to view the various candidates as cop of the art as developed at the early pe when it was in vogue. The following obs tions therefore, will be considered to be ten with a feeling for "mediævalism."

As a general fact, we have to admit, tha English glass-stainers do not take the first in this branch of national competition. taking a first and cursory view of the range of stained glass windows and medal in the northern galleries of the Exhibi our attention was forcibly arrested by striking works of MM. Marechal and Gu of Metz, which, in almost every requisite lity, artistic composition, harmony of co and mechanical execution, excelled all the ductions of their competitors. In the ' trait of a Bourgemestre" the richness of dark yet transparent drapery was very re able. Perhaps the head was a little too b a contrast to the deep background and But in the large painting at its side no defect was visible. "St. Charles Borr giving the Sacrament to the Victims o Plague," was remarkable as a restorati mediæval life and sentiment. The drawi the figures, rude and unsatisfactory, *per se* combined with a devotional sincerity i expression and attitudes, and a local hist truth in the peculiar cast of feature, whic noted the revival of an obsolete art, in a ki spirit. The blue sky in the background rably relieved the warm group of earnest fi in front, and the colouring was of a b which reminded one of the early Italian pai Nor is it in pictorial effect and drawing that Marechal of Metz excels. His med of the thirteenth century style was an lent specimen of colour and design. It monised with the rest of his paintings, though simple in its outlines and its co it is rich both in chromatic harmony and ral effect. Marechal is, in fact, the one glass painter and stainer of the present d Europe. His works have long been k and appreciated in France as the first in line of art. His paintings in the windo the church of St. Paul, at Paris, which furnished some years ago, raised him at above all his competitors in France, both glass-stainer and an artist. Without dw on the minute gradations of merit in glass-stainers and painters, we now pass a general examination of the works most w of attention in the late collection.

Messrs. Chance Brothers, of Birminghar hibited a variety of paintings, amongst whi noticed a Virgin in a green robe, well trasted with some rich crimson drapery. is much breadth and simplicity about figure. We also observed a landscape, would be very well, but for the excess of in the arrangement of its colour. And he may pause to mention a very curious fa to the glass paintings exhibited, viz., that manufacturer or artist seems to have a pec love for one particular colour, in the pr tion of which he succeeds better tha others. Thus, Messrs. Chance's greens are eminent for brightness and transpare whilst, as we shall presently have occasi remark, other glass-stainers excel in colours, and affect them more exclusively.

Mr. Edward Baillie exhibited a painti

Queen Elizabeth listening to the reading of Shakspeare," which surpassed all his rivals in the violent contrast of its ights and shadows, and in the impenetrable opacity of the atter. We cannot say much for the faces or drawing in this group. However, the Queen's white satin robe was very rilliant; and the carpet was really so well executed, that ve could have wished the remainder of the picture up to the ame level.

Mr. W. Wailes is enterprising in design, and displayed onsiderable brilliance of colour and transparency, but there vas a rudeness and harshness about the paintings which was ot pleasing.

The St. Helen's Crown, Sheet, and Plate-glass Company ent a large painting of "St. Michael and Satan," in which he tail of the arch-enemy is prolonged to an indefinite degree. here is some spirit in the drawing, but the execution is amentable in every respect.

Some lions and unicorns by Tobay, the former yellow, nd the latter white, were not very wonderful productions, or in any respect likely to outshine the ordinary lions and nicorns of every-day life.

Messrs. Hetley and Co., of Soho-square, sent a very fine ainting of the "Ascension." In this work the rich colour the foreground contrasts well with the lightly managed mosphere, against which the figure of the Saviour is seen a glory very spiritually conceived and executed.

M. P. Lafaye was doubly unfortunate in being placed by he side of Marechal, to whose works his specimens served as foil. They are muddy in colour, and very inferior in design.

Henri Fougue, sent some curious specimens of mezzotinto ransparencies, produced by glass or china, carved or modelled as to produce the different gradations of light, shade, and tone, a manner remarkable for its softness and purity of effect.

M. Thibaut Dallet had a very brown monk, effectively rawn, but deficient in transparency. His "Judith and olofernes" is a fierce piece, of strong expression, and somehat crude but rich effect. Red is evidently the predominating and favourite colour with this artist. The "Lord's upper" is more transparent, but with little merit either in esign or colour.

Herr Geyling, of Vienna, had a female figure leaning on window-sill, which resembled an oil-painting in effect. The esh of the face and hands, and the white chemise, as well as e dress, are very well executed; but we object to the opaque ckground. As a work of art it reminds one, on the whole, Jullien's coloured lithographs. We consider this a strong ample of success in a line which ought never to be atmpted by a glass-stainer.

M. Thevenot was chiefly noticeable for a blue turn of mind bis colouring. He had, however, some very tolerable ints on pedestals, which were edged with gold, most effectely rendered by transparent yellow glazing. His "Radena" is a severe figure, with much depth and richness in the louring, which is yet too opaque for real brilliancy of effect.

The small Gothic window, by M. Martin of Troyes, was markable as a quaint imitation of the old style of glass cture, as regards artistic treatment and brilliancy of colour. pon these grounds, it was one of the most curious specimens the Exhibition to lovers of the ancient glass-stainers and eir peculiar characteristics.

The painted window by Mr. Gibson, of Newcastle, which we grave, contains subjects illustrative of various passages in e life of St. Peter. It is in the Norman style, and consists six geometrical forms upon a richly ornamented ruby ckground, embodying the principal events from the life of Peter. The centre medallion is Christ's charge to Peter; e others respectively contain the Angel delivering Peter om prison: Peter denying Christ; Christ calling Peter from e ship; Peter's want of faith; and in a small quatrefoil is e martyrdom of St. Peter, the whole surrounded by an borately worked and richly coloured border. The colours the glass are rich and full-toned, and are judiciously comned in the work before us. It is a subject for regret, wever, that, in reviving this ancient art, as a medium, it ould be considered necessary to imitate the barbarous style drawing of the Gothic ages.

We have thus glanced at a few of the most meritorious, rather, to speak conscientiously, of the least sinning, ongst the exhibitors in the Stained Glass Gallery. On a ture occasion we shall return to the subject, when we shall e some account of Bertini's famous Dante window.

Before taking leave of this subject, we would draw this gene conclusion from the examples we have been examining. We ould once more impress upon the improver and enterpriser this branch of decoration, that simplicity, transparency, and oderation in light and shade are the three great requisites er harmony of colour.

NORMAN PAINTED WINDOW.—J. GIBSON.

HISTORY OF INDUSTRIAL EXHIBITIONS.

VIII.—The Exhibitions of England.

THE late Great Exhibition of the Industry of all Nations was the first attempt made on a national scale to gather together for popular and scientific instruction the products of the skill and ingenuity of the greatest commercial nation on the face of the earth. It is strange that the country of Wedgwood, of Arkwright, and of Watt—the seat of the most advanced manufacturing processes, the focus of unlimited capital, the spot whence laden vessels radiate in every direction, the country whose flag floats above more wealth than any rival state can boast, whose scientific men have led the way in the pursuit of wealth, whose legislators have stood in the van of political progress—it seems strange that such a people should have failed to see the advantages which have accrued long since to other nations from national Exhibitions of Industry. The reception with which various endeavours on the part of private individuals to accomplish a national exhibition of the products of English manufacture met repeatedly, confirms the position, that, if this institution has not been before introduced into this country, our native manufacturers are to blame. Opportunities have not been wanting for many years past to carry out native exhibitions with conspicuous success—nothing save the co-operation of manufacturers has been deficient.

London—The Society of Arts.—In a history of industrial exhibitions the efforts of the enlightened men who have successively conducted the operations of the London Society of Arts must find a conspicuous place. This society, it may be pertinent to remark, was founded in the year 1753, for the special object of encouraging the development of arts and manufactures in this country. That it has, throughout the century during which it has fitfully flourished, done much to further the object for which it was founded, not even the most prejudiced political owl can reasonably deny. It has had its seasons of brightness and its days of gloom. It has grown and dwarfed with the progress and retrogression of popular enlightenment. It is unquestionably an institution the success of which is a guarantee of commercial enlightenment: and the anomaly which the co-existence of this society with that of manufacturers' indifference in the matter of a national industrial exhibition, forms a difficult problem for logical dissection. The difficulty is, however, half set aside by a glimpse at the protracted discussions which have marked the foundation of the magnificent bazaar to which the world recently flocked. In the course of these discussions, we find not a few of the eminent manufacturing men of England arrayed against an institution which would draw the veil from the mysteries of their establishments, and make the processes from which their several excellences result patent to the world. They still reverted with pleasure to the dark times of old, when men hoarded their improvements in machinery as the miserable miser hoards his gold; they were unwilling that the foreigner should learn the ingenuity by which they excelled. So pitiful is this narrow view of the commercial aspect of the present time, that the chronicler is inclined to pass by those dissentient voices from the great liberality of spirit which is the boast of Englishmen; but their eminence as manufacturers gives their opinion a weight the more dangerous and to be guarded against, from the animus with which it has been given. The names of a few of these gentlemen have been printed in a report made to Prince Albert, in 1849, of the opinions of English manufacturers on the subject of a great international exhibition; and we are content to let this document lie in the library of the Society of Arts for the edification of future generations, without giving the trivial and vexatious opposition which it describes the currency of these columns.

Having referred to the operations of the London Society of Arts, and premised, that, although the Society annually exhibited these specimens of the competitors for its prizes, it did not succeed before a very recent date in gathering together a complete exhibition of any branch of English industry, it is necessary, chronologically, to direct the reader's attention to the career of the Cornwall Polytechnic Society, which appears to have been the first institution in England that systematically gathered together specimens of local industry for periodical exhibitions within its walls. Eighteen of these exhibitions have already taken place. The latest of these was opened in September, 1850.

Cornwall.—Cornish ingenuity has been keenly excited by the prizes annually offered at these exhibitions; and, accordingly, we find several inventions of some importance ranged within the Cornwall Polytechnic walls on the last occasion. Among these figures was a large model by Mr. T. Ward, of Falmouth, showing a method of building under water without the use of the diving-bell, &c. The construction of this model was rewarded with the first silver medal. The second silver medal was awarded to Mr. John Pool, jun., of Copperhouse Foundry, for a model of an improved paddle-wheel for steamers. In this wheel the floats are only half the usual size, the deficiency being made up by an additional number. The inventor asserted that by the adoption of his plan the concussion on entering the water would be much less than with a full-sized float, and on leaving it the backwater would be much diminished. "The method of shifting the floats and contracting the wheel's diameter is so simple that it can scarcely ever get out of order, and their division into two series will admit of each portion being reefed separately. The advantages of this will be felt in a heavy sea, when, to secure a proper resistance for the wheel, the inner series of floats may lie left of the full diameter, and the outer ones may be close reefed. By these means the wheel will seldom be entirely out of the water, or so deeply immersed as to check the speed of the engines. The reefing is effected by means of a toothed wheel and pinion movement."

The first bronze medal was adjudged to the inventor of a plan for producing sharp casts of plaster by means of a vacuum. The jury of the mechanical department report the progress of county ingenuity with justifiable pride. The following paragraph of suggestions is extracted from the jury's report:—"Plans for improvements in forming cogged-wheels for mining machinery have, for the last two meetings, been submitted to this society, for which the judges have awarded premiums; and the judges for the present year have with pleasure awarded a first bronze medal to another plan for that purpose, which, in accordance with the opinions of parties most interested in the improvement of gearing, promises to be of extended utility. The judges conceive that this most desirable object can be best effected in each locality by schemes suited to their respective wants or state of progress, gradually developed, rather than by the adoption of forms specially suited to other purposes: and they have viewed with satisfaction the unceasing efforts at local improvement, and trust that as high a standard of excellence in mining machinery will be eventually established as is admitted to exist in the cotton-manufacturing districts.

"The judges have likewise awarded a first bronze medal to a series of elaborate tables especially adapted for the daily calculations of a miner. Their value has been tested for several years in a mine in the eastern part of this county, where they have been found of great assistance to the agents. A first class prize has been awarded to a pocket surveying compass, which promises to be a useful instrument under certain circumstances. A first prize has been given to a model for striking a helix, which shows considerable ingenuity in the contrivances for separating the lines made by two pencils employed. A book on mechanics, of the value of a fourth prize has been awarded to a boy of fifteen, whose attention has been directed to the improvement of a Savery's engine, of which he has submitted a plan to the judges: they deem they have acted in accordance with the views of the society in this award. The judges have awarded a first bronze medal to the workmanship of a dividing engine, and of a slide rest. As these instruments are of the greatest value in the execution of good work, such as is specially required for the local interests of this county, the judges have since heard with great pleasure that the premium has been adjudged to a person who has been an apprentice to a well-known exhibitor of mining instruments of superior workmanship. A first bronze medal has likewise been adjudged to a skeleton clock, the parts of which were cast, made, and cut by a clockmaker of this county, in rivalry of the work of those districts in which clockmaking is a special trade. A second prize has been adjudged to a set of small knives, for the skill and ingenuity exhibited in the workmanship. The judges do not consider such ingenuity entirely wasted, since its exertion confers a power on individuals that may eventually be applied to objects of utility; and the same remark is applicable to a prize of the value of 2*s.* 6*d.* adjudged to a lad for a puzzle box that he has exhibited. The judges have further awarded the society's second silver medal (not convertible into money) to an extremely well-executed drawing of a balance apparatus used in the coal mines of Wales, and applicable under some conditions, to the Cornish mines. They are satisfied that the society is extremely desirous of encouraging a full and accurate knowledge of the practice and plans of other mining districts, with a view to the adoption, or the employment of such modifications as may be deemed advisable. The judges, with the consent of the committee, have awarded an extra prize of 2*l.* to a small model of a steam-engine, made by an engine-man in his leisure hours, which is well executed under circumstances of obvious difficulty, and which must have required a study of the form and proportions of every part of an engine, which must be a very useful exercise to a person to whom is entrusted the constant care of an engine."

The Cornwall exhibitions, like all others (except the last three at the house of the London Society of Arts), have partaken of the character of bazaars, since they have included curiosities in natural history from all parts of the world, as well as amateur oil and water-colour paintings. Yet even under the general head of natural history, we find that the jury paid particular attention to county exhibitors. Thus, the second silver medal was given to William Loughren, of the coast-guard, for ninety species of fishes procured from the Cornish coast, and preserved by himself. "Of no less value is the collection of Algæ by Miss Warren, to whom we also award a second silver medal. The specimens are named systematically; and, if they do not form a perfect marine herbarium of Falmouth harbour, they leave but little to desire." Even the Cornwall boys contributed illustrations of the natural history of their county, in the shape of collections of bird's eggs. The exhibition consisted of 612 distinct articles; and the presence of a remarkable number of boys and men of the working classes attests the spirit of emulation which the institution has evoked throughout the country. The rich resources of Cornwall are by its agency subjected to a thorough mechanical and scientific examination. Cornwall naturalists are encouraged to class the living creatures indigenous to their county; miners are exhorted to improve the machinery of their mines; amateur artists are offered a public wall for the display of their local sketches; the young ladies of Cornwall, as they pace the shore of their southern county, are reminded that they will receive honour and thanks from their neighbours if they will learn to class the weeds which cluster about their feet; and the coast guard, as he wanders moodily along the sea-side solitudes of

l's End, is stimulated to play his part at the local exhibition. The stry, the science, and the natural history of the county find their nal representatives; and the processes which tend to cheapen the proion of its embowelled wealth, receive daily new and improved lopments.

anchester. Next in order of succession, Manchester claims popular co, for its endeavours after an industrial exhibition. The idea of olishing a collection of "specimens of natural history, works of art, mechanical contrivances" within the walls of a Mechanics' Institution tributed, in the report of this institution for 1838, to its President, Benjamin Heywood; and it was at this gentleman's suggestion, that, in 8, a circular was issued to the manufacturing and scientific men of the ty, which, as it indicates the comprehensiveness of the first Manter scheme, deserves a *verbatim* insertion in a History of Industrial bitions:—

"..., —I have the pleasure of informing you, that the directors of this Institution intend, g the Christmas vacation, to open the various class and lecture-rooms for the exhibif objects illustrative of science, art, manufactures, and natural history, to afford the bers of the institution and the public generally an opportunity of inspecting, at their e, the present state of the arts and manufactures of the town; to bring together rous instances of the practical application of those scientific principles so frequently nded in our lecture-room; and thus, by blending instruction with amusement, to furnish great community in which we live a source of intellectual improvement and rational tion. The following outline will display the principal features of the intended bition, and it will, at the same time, be useful as a guide to those friends of the insti- who may be disposed to promote this object by the donation or loan of philosophical uments, models of machinery used in the various important branches of British factures, and specimens illustrative of the several departments of natural history. IMENTAL PHILOSOPHY—*Statics and Dynamics:* Instruments to illustrate the f equilibrium and motions of solid bodies; elements of machinery, various kinds of , wheel and axle, pulleys, inclined planes, screw, and the wedge, their application dify motion: illustration of centrifugal force. *Hydrodynamics:* Instruments to rate the laws of pressure, equilibrium, cohesion, and motions of fluids; hydrostatic ox, press, bellows, balance, &c.; hydraulic machinery, water-wheels, machines by the reaction of water; clepsydræ, hydraulic ram, Archimedes' screw, blowing nes, &c. *Pneumatics:* Instruments for exhibiting the mechanical properties of air her elastic bodies; air-pumps, condensers, barometers, machines for raising water, us kinds of pumps, syphons, fire-engines, &c. *Heat:* Instruments for illustrating eory of heat, such as thermometers, pyrometers, parabolic reflectors, &c. *Light:* nal and other models of various optical instruments, such as telescopes, microscopes, a-obscura, camera-lucida, &c.; instruments for exhibiting the polarization of light, l delusions, machines for grinding lenses and specula. *Electricity:* Comprehending ments for illustrating the phenomena of electricity derived from friction, galvanism, tism, electro-magnetism, and thermo-electricity. *Astronomy:* Models of instruments purpose of observations and computation, such as mural circles, transit instruments, ontrivances for illustrating the motions and phenomena of the heavenly bodies, such netariums, orreries, armillary spheres, &c. *Geodesy:* Instruments in use for surveying vision of land, theodolites, levels, circumferenters, perambulators, pentagraphs, &c. *stry:* In addition to the apparatus usually employed in chemical demonstrations, it desirable to obtain samples of the various drugs used in the arts, particularly in ocesses of bleaching, dyeing, and printing. THE FINE ARTS—*Architecture:* Models rawings of public buildings, specimens of materials used in their construction. nens of sculpture, modelling, carving, painting, engraving, &c. THE USEFUL ARTS *kwork, Masonry,* and *Carpentry:* Specimens of building materials, such as stone, , brick, lime, cement, &c.; models of roofs, centres for bridges, specimens of various of wood, &c. *Mill-Work:* Models to illustrate the elementary parts of mill-work, ferent methods of engaging and disengaging machinery; contrivances for equalising, itting, and converting motion from one species to another; models of various kinds ls, wheels, &c. *Steam-Engines:* Sectional models and drawings to exhibit the s parts of the modern steam-engine, under various forms, and their application in gle and double-acting engine, high-pressure engine, vibrating engine, &c.; models strating the application of steam power to mining, to navigation, to locomotive s on railroads and common roads. *Civil Engineering:* Models and drawings of of public and domestic utility, such as sea, river, canal, railway, and common road- gas-works, water-works, mining, &c. *Manufactures:* Models for illustrating s manufactures from fibrous materials, with specimens in cotton, silk, flax, wool, d, &c.; models to illustrate the art of bleaching, dyeing, and calico printing; s connected with the production and manufacture of cast and wrought iron, and metals; models connected with the manufacture of artificial substances, as porcelain, acids, salts, pigments, &c.; models to illustrate the arts of letterpress printing, by and machines, copperplate and lithographic printing. *Natural History:* Specif crystals, minerals, geological charts, fossils; specimens in botany; specimens in logy, ornithology, ichthyology, zoology, &c.

he united and zealous exertions of the members and friends of the institution, the rs feel assured that a source of rational and agreeable relaxation may be established made the means of diffusing a great amount of useful and interesting information. afford our ingenious mechanics and artisans a convenient opportunity of inspecte practical application of scientific principles in the construction of machinery; of the present state of perfection of our manufactures, and it is hoped it will be the of stimulating them to scientific research in the improvement of their respective nd assist them to contribute beneficial results to this great metropolis of ctures.

ake this exhibition useful, attractive, and interesting, great labour will be required, l as considerable expense. Every exertion will be made to remove the first e; and, with respect to the second, an appeal to our liberal townsmen, who are willing to support works of public utility, will not be made in vain.

SAMUEL E. COTTAM, Secretary.

s circular had the effect of concentrating within the walls of the nester Mechanics' Institution a very interesting collection of models, actures, paintings, and curiosities in natural history, from 150 conors, for the amusement and instruction of the Christmas holiday folk 37. The exhibition remained open from the 26th of December till d of February, and was within that space of time visited by 50,000 s. At the annual meeting, held a few weeks after the close of xperimental exhibition, Mr. Benjamin Heywood referred to it in of great gratification:—"For my own part," said this gentleman, "I e to confess I had no anticipation of the degree of success which has ed it; and I believe I am not very far wrong when I say that its have not a little surprised my excellent friends near me who have l so zealously in its preparation. How delightful is the contemplation rything connected with it. Where shall I begin in the enumeration happy influences! Shall I speak of the spirit which animated those who undertook its preparation and arrangement? of the days and nights of labour they devoted to it? of the readiness and kindness with which contributions of all kind were offered? Shall I speak of the gratification afforded by it to thousands and tens of thousands who had never seen anything of the kind before? of the new and nobler taste which it has awakened in the minds of many of them? or shall I speak of its value as an example to other institutions, possessing rich and beautiful collections, from which the public have hitherto been excluded? It was delightful to see the countenances, beaming with pleasure, of the working men, their wives and their children, as they thronged through the rooms, and gazed upon the different objects; and I could not help feeling that in many of their breasts a chord must have been touched, the vibration of which will have given life and permanence to new and happier feelings within them. . . . Let me beg your attention to the personal appearance of your directors and your president this evening: we are all in the livery of the institution; we are all in waistcoats woven at the exhibition by the . . weaver . . . loom and whose work excited so much interest." On turning to the accounts of the institution, we find that the exhibition realised no less a sum than 1078*l*.

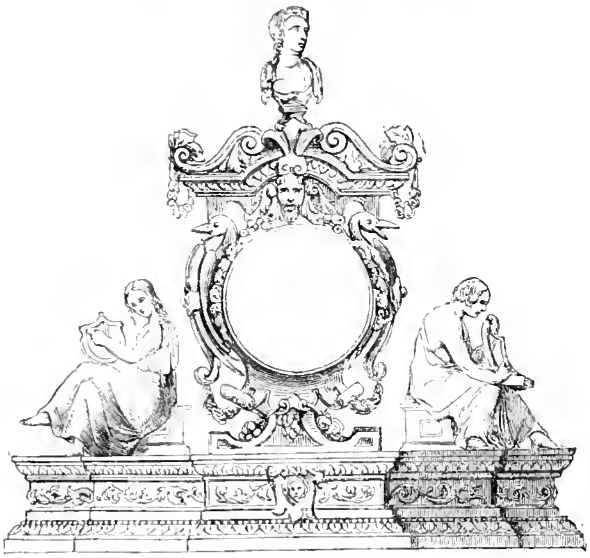
The second Exhibition of Manchester industries, arts, and curiosities, was opened on the 26th of December, 1838, and showed a list of contributors 360 strong, and a list of articles amounting in number to 26,300. Amongst these articles there were 21 models of steam-engines, 79 models of useful machines and ingenious mechanical contrivances, 20 models of ships, packets, boats, &c., 400 specimens of manufactures, 12 models of public buildings, 40 specimens of papier mâché and cabinet-work, 90 philosophical instruments, 160 ancient and modern curiosities, 1050 medals, coins, and plaster casts of medallions, 171 paintings, 290 engravings, 10,000 insects, 1120 birds, 7000 mineralogical and geological specimens, and 4000 shells. Not less than 100,000 visitors flocked to this Exhibition, and left in the treasury of the institution about 2320*l*. This sum, together with that realised by the first exhibition, were devoted to the long-cherished object of paying off the debt due upon the building of the institution. At the annual meeting held while the second exhibition was open, Mr. . . Newton (who appears, with Mr. Belshaw and others, to have taken an active interest in these exhibitions) threw out some suggestions for future guidance. He said, "It has now been practically demonstrated that the most valuable depositories may be thrown open, at a small charge (that to the Manchester exhibitions was sixpence), to the public indiscriminately; and that the owner of works of art, of specimens of the productions of nature, and of curiosities in general, may rely with confidence on the honour and good sense of the poorer class of his fellow-countrymen: that he may trust his most rare and valuable articles to their general examination, and have them safely returned, accompanied by the warmest thanks of a gratified public. . . . . Excellent as is our present exhibition, I think that it is yet capable of improvement. I should like to see it descend more into our commoner manufactures for some of its articles. One department of it might be appropriated to what should be termed a sample and pattern-room, in which should be placed specimens or samples of manufactures in general. The different trades might be solicited to exhibit in this room the most improved specimens of their various productions. I am aware that this is now carried out in a considerable degree, but I would still further extend it. For example, why should we not exhibit samples of dyeing, of calico-printing, of the cotton manufacture in general, of paper for house decorating, improved specimens of boot and shoe-making, of hat-making, of book-binding, or of any other trade, the articles of which are not too large or inconvenient for exhibition? We have already articles, and most beautiful ones too, of the more showy species of trades and manufactures, such as clock and watch-making, of papier mâché manufactures, mathematical instruments, philosophical apparatus, &c.; and why not exhibit also improved articles of some of the more humble but more general and useful trades? These are merely hints for next year's exhibition, which may or may not be adopted, as circumstances determine. But I certainly should like to see our exhibitions possess, in addition to the general interest which they must and will always have, a depository in which as many as possible of our artisans might view and exhibit the most improved articles on which they are daily employed." These suggestions are worth recording in a history of the development of English industrial exhibitions. In their report for 1838, the directors of the Manchester Mechanics' Institution describe deputations as having waited upon them from several towns for information on the details of the Manchester exhibitions.

The Exhibition of 1840 was a comparative failure, having attracted only 43,450 visitors, and realised 833*l*. It consisted principally of pictures, and is remarkable chiefly for the reappearance of an *Exhibition Gazette*, started for the special purpose of giving critical descriptions of objects exhibited on this occasion. This *Gazette* is a curious periodical to refer to.

The fourth Manchester exhibition was not opened till the 26th of December, 1842. It occupied four rooms, and included some attractive specimens of improved manufactures. Passing by the collection of Chinese curiosities and the picture gallery, we may at once notice the specimens exhibited by various manufacturers as the results of the Jacquard loom. First of these was a *tableau* of the will of Frederick III. of Prussia, surrounded by a classical design, manufactured by Messrs. Meyer and Co., of Berlin, and presented by them to the Manchester Mechanics' Institution. The *tableau* is woven in what is termed a 3600 set reed. It requires in the working the power of eight machines, each machine containing 600 ends

of silk, or 4800 ends in the whole. There are about 3750 cards on each machine, or 30,000 cards in the whole. The size of the paper on which the design is given would be 18 feet by 21 feet, whereas the woven silk is not more than some 16 to 20 inches.

A second specimen of Jacquard weaving was a portrait of Jacquard himself, contributed by Mr. Henry Hilton, of Mosley-street, Manchester;

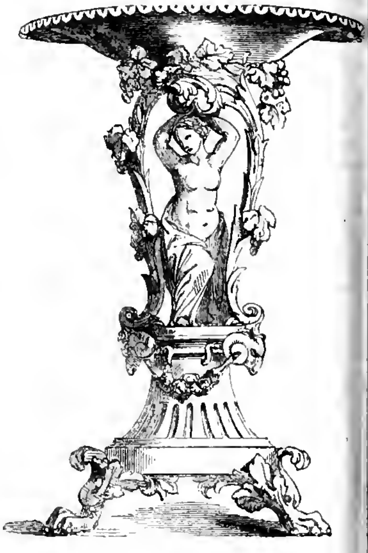


OR-MOLU CLOCK-STAND.—POTTS.

another specimen was the "French Conscript," contributed by the Manchester School of Design; and the last specimen represented the will of Louis XVI., and was contributed by Messrs. H. and E. Tootal, of York-street, Manchester.

The Fine Art department included a contribution from the late Sir Robert Peel. Specimens of raw and spun cotton yarn from No. 1 to No. 460; inlaid work, plants, and engravings. The mechanical room, as described in the *Exhibition Gazette*, was particularly interesting. "Here we have a glass-blower, a stocking-knitter, a seal engraver, and a likeness-cutter; two kinds of weighing machines, at which, for the small charge of one-penny, the curious in corporeal gravity, absolute and specific, can have their own proper ponderosity determined to a fraction; divers hydrostatic machines and pumps; some beautiful railway models, of bridges and stations; a glass in which long faces may be pulled any moment; and an antidote thereto, in one which gives an enormous breadth to the countenance. There is a turret clock, contributed by Messrs. Sharp, Roberts and Co., which is admirable for its simplicity and strength and some beautiful working models of calico printing machinery, and of other machines connected with this branc of industry, contributed by Messrs. Thomas Hoyle and Co."

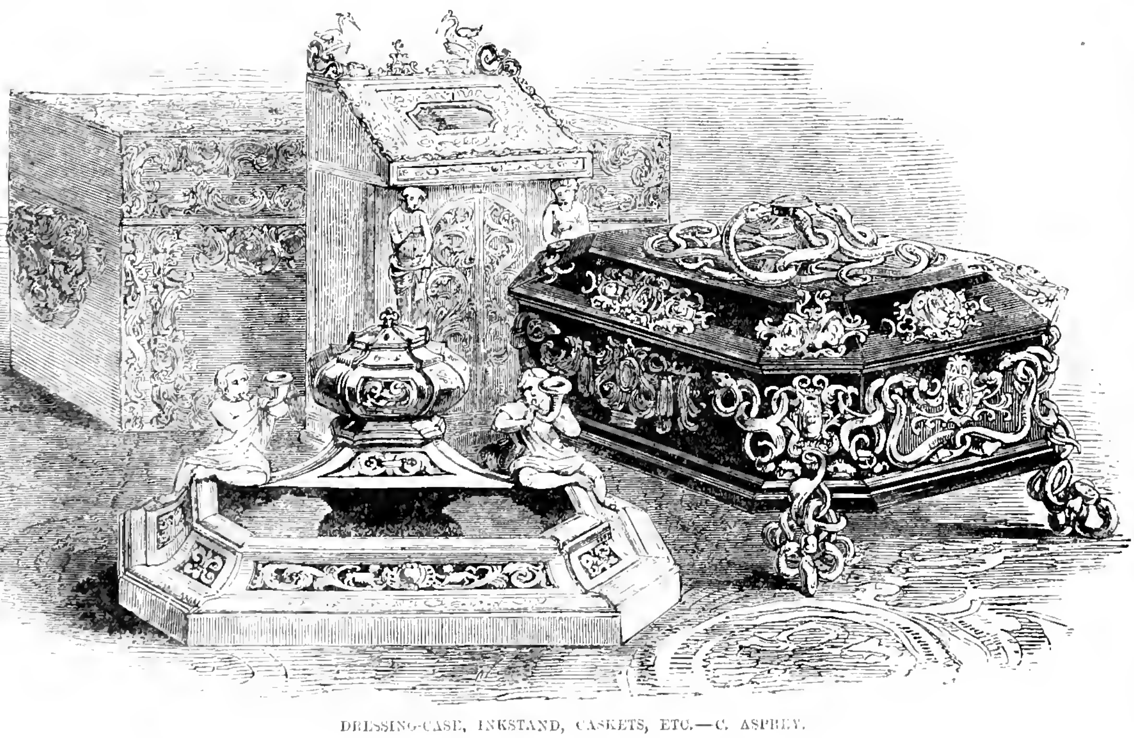
The Fine Arts room included a self-acting pianoforte, exhibited l Messrs. Marsden and Son. It played a number of tunes by the agency revolving barrels. In this room a specimen of French ingenuity figured, the shape of a ship carved in ivory, executed at Dieppe. It is possib only to mention a few other interesting evidences of ingenious industry. Among them were—a hydraulic machine for drawing lead piping; a clock on the principle of the inclined plane, having dials to indicate the progress of time, by the second, the minute, the hour, and longer periods, also the hours and degrees at the various important positions on the earth; specimens of reeds made by patent machinery; pods of cotton from Egypt; specimens of silk spun by wild worms in Assam; "the mechanical paradox;" patent machine (Edmonson's) for printing railway tickets; a machine for testing thread, "which enables the operator to ascertain the strength of the thread, from one grain to a thousand grains;" specimens of cut, coloured, and stained glass; dinner plates of the time of William and Mary, near the latest productions of Staffordshire skill; specimens of the various stages of the flax manufacture; anatomical cast of a horse; a marriage veil worked in Morocco by a Jewe a series of the Poniatowski gems; "and a flower-basket composed of t hair of about eighty family friends at Hamburg."



OR-MOLU FLOWER-STAND.—POTTS.

Nearly four hundred persons contributed to this exhibition. It ı open for nearly three months; was visited by about 100,000 people; ε realised about 1800*l.*

The fifth Manchester Exhibition, which was opened at Christmas, in 18 partook of the characteristics which distinguished the previous exhibitio An over-anxiety to introduce all kinds of attractive, but uninstruct entertainment, such as profile-cutting, &c., has somewhat detracted fr the high character which these periodical displays might otherwise h held; and too evident a regard for the pecuniary proceeds, rather than moral improvement, has lessened the estimate which liberal minds wo have formed of the endeavours of those gentlemen who have mainly c tributed to the success of these exhibitions. No prizes have been awar at these Manchester exhibitions.



DRESSING-CASE, INKSTAND, CASKETS, ETC.—C. ASPREY.

MUSICAL INSTRUMENTS.

KÖHLER'S IMPROVEMENTS IN BRASS INSTRUMENTS.

E great perfection of tone to which brass musical instruments have been rought of late years, renders their effect in the orchestra so charming, no band is now considered complete without several of them. Indeed,

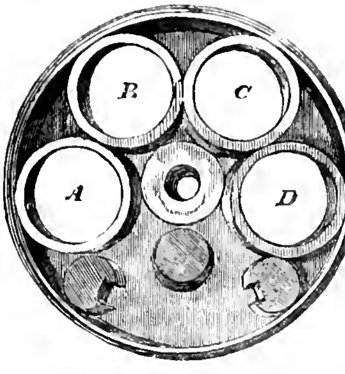


Fig. 1.—Interior of lower or fixed valve plate.

cornopean is now considered as an essential element of even a small d, and is also highly prized in solo parts. When it is recollected that original form of the cornopean was that of the keyed bugle, it cannot

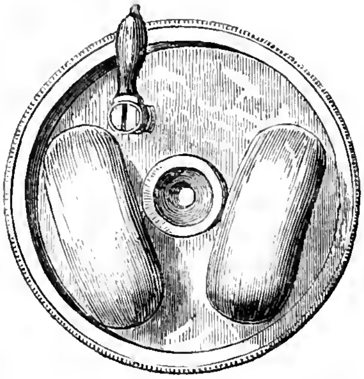


Fig. 2.—Top view of upper valve plate.

be interesting to contrast the perfection to which it has now attained me of our leading makers' hands. The Sax-horns, which have become

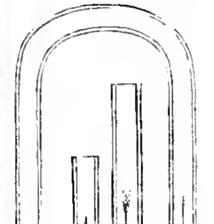


Fig. 3.

Fig. 4.

Cross section of windways of valve plate.

so opular through the very excellent playing in concerts of numerous pr ssors, who have made this class of instruments their study, are also an ler modification of the cornopean. The Great Exhibition offered pe iar facilities for comparing the present state of perfection to which the instruments have been brought by various manufacturers. An inspection of the French and English cases, sufficed to give us a full insight into all the various modifications and improvements which have been introduced, and proved that much ingenuity had been bestowed upon the various details of the manufacture of these instruments. The most im-

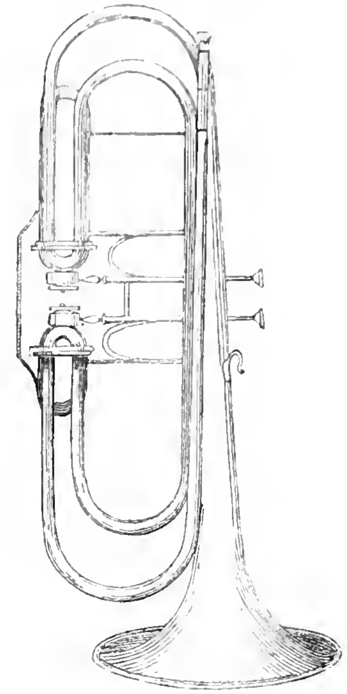


Fig. 5.—Patent lever trumpet.

portant which presented itself to our notice, were some recent ones introduced by Mr. Köhler, who was also the largest exhibitor of this class of instruments in the English department of the Great Exhibition. It is only just to the high reputation which this maker has attained in this

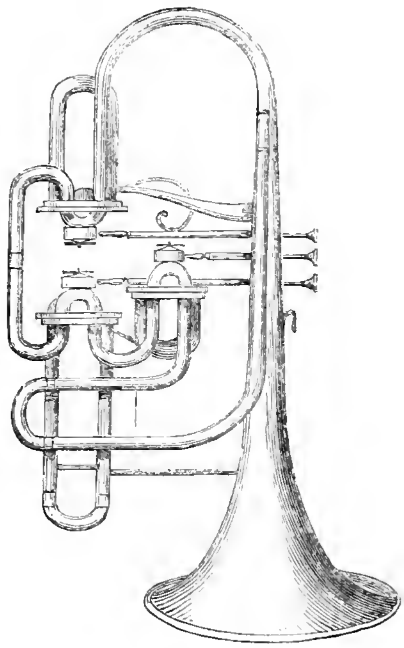


Fig. 6.—Patent lever cornopean.

country, and in India, that we should note his endeavours to worthily represent them in competition with the rival makers on the other side of the channel. Mr. Köhler's contributions to the Exhibition embraced nearly every form of approved brass instruments, viz:—trumpets, cornopeans, clavicord, French horns, trombones, sax-horns in alto, soprano, tenor, tuba bass, &c., ophicleid, clavicor, and a new instrument which he has named the "Patent Lever Bombadone," the largest brass instrument made. It

appears that these beautiful instruments, which have now been, for some time, in use by her Majesty's bands, are constructed with an entirely new system of valves, which act with the greatest ease and precision; and they afford a facility of execution which surpasses the most laborious study of the old piston-valve. Another most important advantage in these instruments is, that the tones produced by the complementary windways are all

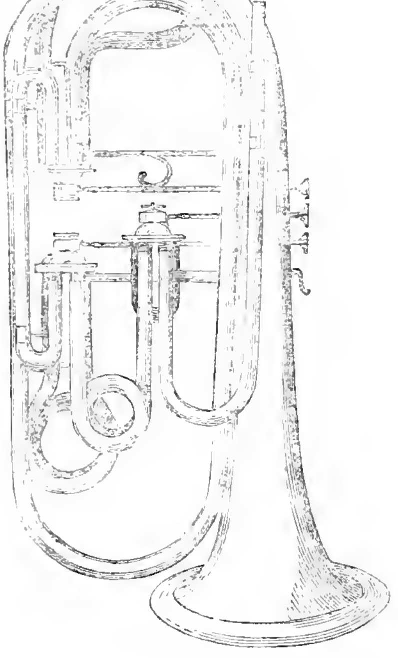


FIG. 7.—PATENT LEVER TROMBONE.

insured of equal quality, as the new valve allows a perfectly free and circular passage throughout the whole windway of the instrument—a desideratum never before attained.

It will be seen on comparing the engravings of the windways and the

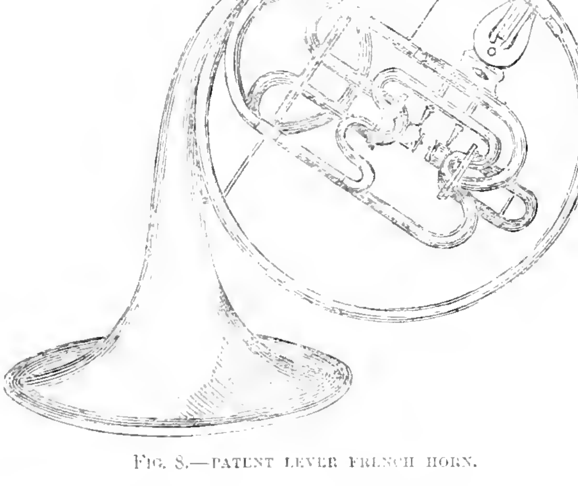


FIG. 8.—PATENT LEVER FRENCH HORN.

valves of these instruments with the old ones, that their structure and arrangement are radically different from any others. The angularity both in the complementary and main windways is *entirely* obviated:—See engravings, 3, 4. This is accomplished by the substitution of a peculiar valve which may be thus described:—

The valve is formed of *two plates*, or discs, with perforations in them of the same diameter as the windways of the instrument. These two plates are formed with *true faces*, which move freely upon each other; the perforations in which A, B, C, D, (fig. 1,) form the communication between th supplementary windways, which form the *whole tone, half tone*, and *to and half tone*. The structure of these plates may be seen from th diagrams. Fig. 1 is a represention of the under plate, which is fixed to th main and complementary windways, A, B, C, D. Fig. 2, is the upper sid of the valve-plate, which is kept in its place by means of a screw colla which is fitted to the under or fixed plate. The surfaces of the plates a kept close together by means of a delicate spring, fixed in a box, and hel down by a screw-pin, passed through the centre of the two plates. Th plates thus held together form perfectly air-tight valves; and the consta use of them can in no way damage them, as is the case with piston-valve It must be obvious that two *true* surfaces acting upon each other wi an *equal* bearing upon every portion of their superficies, can in no wa deteriorate each other. This is the reason why the tone of the pate instruments never varies under any climate of the world, even after ma years' use, as certified by the bandmasters of her Majesty's service, wl have had them in use in different parts of the world. The modes in whi the valves are worked has recently been much improved; the wat spring formerly used is now entirely superseded by a spiral brass spri placed under the shoulder of the lever, and inside the guide box of t rod or lever, which acts on the valve. The spring is thus entirely remov from all danger of corrosion, besides being much more lasting than the o watch spring; neither is any skill required, to replace it with anoth The valves are all now easily accessible for the purpose of cleaning, a their structure is such that they will never wear out.

Having shown the peculiar form of the valves, we will now proceed describe the manner in which the windways are made throughout t instrument *entirely free* from all irregularity. Fig. 3 and 4 is a cross secti of the plate-valve, representing its attachment to the pateut lever trum and trombone (figs. 5 and 7). A. and B. shows the windway of the *wh tone* open in fig. 4, and shows the direction of the wind from the m windway. D and C. Fig. 3 shows the *complementary* windway for *whole tone* closed, which is effected by the unperforated part of the val plate (fig. 2) being pushed over it by the action of the lever E.

It will be observed that the windways of the valve are in reality continuation of the tube of the windway, and that it is of an equal cu or bow to the curves of the main windways. The outside appearance the valve is that of a bulb on the valve-plate (fig. 2), as the valve and plate are made in one piece. We have no doubt, however, but that diagrams and engravings of the instruments will suffice to convey a cl and correct notion of the means by which a direct, free, and circu passage for the wind throughout the whole instrument is secured, with forming any acute angles, and, consequently, a fulness, clearness, brilliancy of tone which surpasses that of all other valve instruments permanently secured.

It must be obvious to every professor of music or scientific person, contrasting the construction of other instruments with these, that the ac angles connected with the old valve instruments must evidently be a g obstruction to the free passage of the wind, and, as a consequence, m materially deaden their tone; whereas an instrument which preserves entirely unobstructed circular passage for the wind, must necessa preserve its clearness and fulness of tone in all its notes. The unobstru action of the wind, moreover, removes much of that difficulty and exert in the production of notes required by other valve instruments; wh also, the improvements which have lately been added gives to the perfor the additional advantage of shortening or lengthening the tubes v greater facility and quickness than can be done on any other instrumen

INDIA-RUBBER AIR-GUN.—Among the newly invented articles which Exhibition has enabled inventors to bring before the public—altho they are not so numerous as they would have been, had a system of p tection for inventions been assured at an earlier period—there are so which display a considerable amount of ingenuity. As an instance, may mention the new india-rubber air-gun exhibited in class 8, and bea the catalogue number 254. It is the invention of Mr. John Shaw, mus instrument maker of Glossop, favourably known as the author of on two important improvements in wind instruments. The great singula of the new air-gun consists in the entire absence of air-pump, reservoir, valves, which in the common air-gun are attended by no small amoun trouble, and some personal danger. The air which expels the ball is pov fully compressed *at the moment of discharge*, by a piston acting withi cylinder, and moved with great force and rapidity by the sudden traction of a spring, composed of a number of vulcanised india-rul rings previously extended by hand in a very simple and easy manner; the ball is propelled with a force quite equal to that exerted in the com air-gun. It has this advantage, also, that its discharges are always unif in strength, and can be made with great precision, facility, and saf Specimens of flattened bullets were exhibited in the case, which show power to be fully equal to the average shots of the ordinary air-gun. invention is certainly a most ingenious application of the elastic forc vulcanised india-rubber, an article which possesses so many useful quali and the application of which to a vast variety of purposes is now so gen aud progressive.

HEMP, ROPES, AND CORDAGE.

It is supposed that the ancients were unacquainted with the present use of hemp, since, though Pliny, in the 23rd chapter of the 20th book of his "Natural History," describes the plant, he does not allude to the most important of its uses. The hemp plant, *Cannabis* (the *Kanabis* of Dioscuros), has a tall, straight stem, about six or eight feet high, hairy and quadrangular, with large serrated leaves. It will grow in almost any soil properly manured; and as many as seventy crops of hemp have been grown in succession on the same land. The neglect of its cultivation here and in Ireland has been often deplored. The Indian hemp (*Cannabis indicus* of the "Materia Medica") possesses very strong narcotic stimulant properties. It is called *majah* in India, and *hachish* in the Levant. Lamartine, in his "Vision of the Future," and Alexandre Dumas, in his "Monte Christo," have introduced descriptions of its singularly intoxicating effects. In colour the extract of Indian hemp is a bright green. Its virtues are analogous to those of opium and henbane. We should not have alluded to these facts, were it not to support our own conviction that the common hemp contains similar properties, though in a less powerful degree. And of this we are convinced by a curious incident which came to our knowledge of some sailors, who, having on a voyage exhausted their tobacco, took to chewing small pieces of rope, which they found a very excellent substitute for the genuine pigtail. Of course, but for our knowledge of the properties of Indian hemp, we should have attributed this entirely to the effect of imagination, that easy refuge from an investigation of natural causes.

It is considered that the best hemp is grown in the southern provinces of the Russian empire. Riga hemp is held most in esteem. The other principal variety of Russian growth is called St. Petersburgh hemp. In such cases the name is derived from the port at which the article is shipped. East Indian and Manilla hemp are the two other chief varieties. They are whiter in colour than the Russian. Of the two, Manilla is preferred. The latter is also now extensively used in matting, especially in combination with cocoa-nut fibre.

The way in which a rope is made is this:—First, the hemp is hatchelled or combed, to clear it of the short ends, which would otherwise run in with the long. Train oil is used in this process, for the purpose of producing evenness, and causing cohesion of the fibres. Too much oil, however, must not be used, as it would prevent the hemp from taking the tar afterwards to be applied to it.

The second process consists in spinning the yarn, that is, forming the hemp into separate and continuous threads. After being warped, or stretched, and slightly twisted, the yarn is then tarred with boiling tar. Several yarns are then twisted together, to form what is called a strand; and the twisting of the strand together forms the rope. Of course, this process of twisting and re-twisting may be pursued to almost any extent; and in proportion to the amount of labour bestowed upon a rope in its separate combinations, will be its strength when finished. To illustrate the principle, which must guide us in our criticism of the cordage exhibited, it should be called to mind that the more the points of resistance are multiplied in any mechanical construction, and the more perfectly they are brought into unison, the less will be the strain or pressure on one point in particular. Now, the more elaborately a rope is twisted and combined, the greater will be the number of points of resistance—the greater, consequently, the strength of the rope. Indeed, there would be scarcely any comparison possible between the strength of a good cable-laid rope and of a mere union, without twisting of the yarns which form it.

The French ropes in the Exposition were remarkable for laborious detail. One specimen, especially, of white or Manilla hemp, nearly free from tar, especially excited the admiration of our nautical friends. The beauty of the French ropes exhibited consisted in the care with which the yarns and strands were prepared. Either more work had been bestowed upon them, or the French machinery is more perfect than others. Perhaps, however, this finish may be, to a certain degree, superficial, and the difference in strength, which is the great point between these and similar English specimens, is very immaterial.

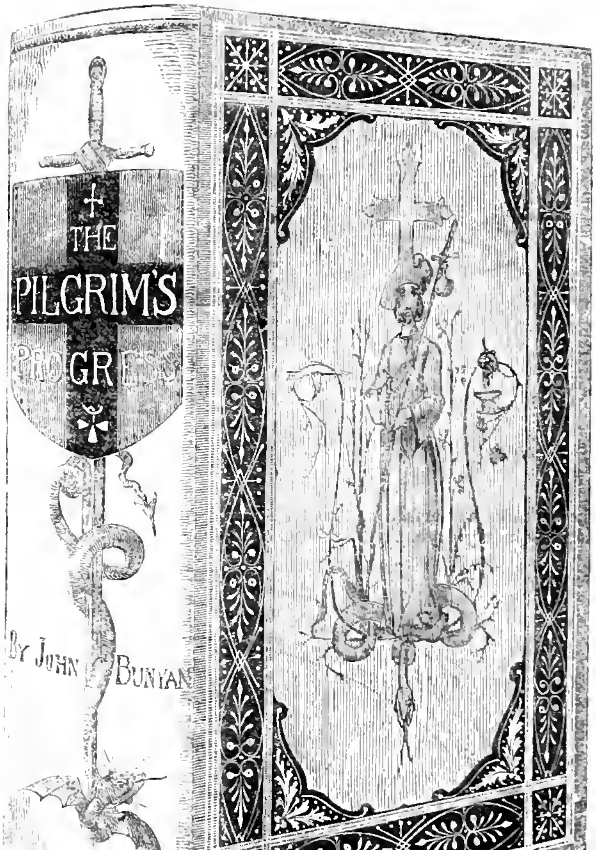
The English cordage was interspersed amongst the hardware and miscellaneous articles on the south-west side of the Central Avenue. Robertson, of Limehouse Hole, exhibited specimens of large rope for [illegible]ds, &c., and smaller cordage for topmast rigging, of very excellent manufacture. Some 11-inch rope, applied as stop-rope to a cannon (to counteract the recoil after a discharge), was particularly strong and well-made. Haggie Brothers, besides some very fine specimens of ordinary laid rope, exhibited flat ropes for the winches by which baskets are raised from coal-pits, of great strength and finish. Nor, though not strictly pertaining to our subject, should we omit to mention, incidentally, some round and flat *wire* rope, by R. S. Newall and Co., of Gateshead on Tyne, intended for the standing rigging of vessels and the support of suspension bridges, to which they appear eminently adapted. For on the same principle that a Damascus blade, hammered out of an infinity of wires, is tougher and more trenchant than an ordinary sword, these wire ropes must be superior in sustaining power to the link chains in ordinary use, made of solid masses of metal.

The patent rope manufactured from Manilla hemp, by Spencer and Coopers, of Hull, was well worthy of attention, as were also the flat ropes made under the improved patent of S. H. [illegible], of Truro. We cannot say much in commendation of the Gourock Rope-work Company, of Greenock; though, perhaps, want of external finish is the only fault of their manufactures. Sir Joseph Huddart and Co., of Limehouse, exhibited a very ingenious machine for twisting the yarn and strand. We presume Sir Joseph is either the original patentee or the son of the Joseph Huddart, of Islington, who some fifty years ago took out one of the earliest patents for a rope-making machine. The specimens of this firm were amongst the finest in the Exhibition. Joseph Crawhall's (of Newcastle) improved patent rope-making machine, exhibited in the Machinery in Motion department, was, however, the most perfect thing of the kind yet invented. It twists the yarn, the strand, and the rope, by one and the same process, several smaller wheels turning round the principal spindle. It is beautifully simple in its construction.

In the Russian department we found only two exhibitors of rope, Michael Milnikoff Glouskoff, of the government of T[illegible], [illegible] and Cazalet, of St. Petersburgh, whose specimens, though not equal to the French or English ropes, were by no means of striking inferiority. We should have expected, however, something more from the land of hemp *par excellence*. But it is not always the case that a country excels in the manufacture of the raw material which it produces.

The ropes of Felten and Guillaume, of Cologne, were much better: indeed, to all outward appearance, quite equal to those of our own manufacture. Blenkenburg, of Lippstadt, chiefly excels in small cord and string: but H. J. Hoerkens, of Lubeck, sustains the reputation of that Hanseatic seat of commerce by specimens of unexceptionable texture.

In the East cordage is made of the fibrous matter found in various other vegetable products, as pine-apples, the aloe, the plaintain, the cocoa-nut husk, and even nettles.

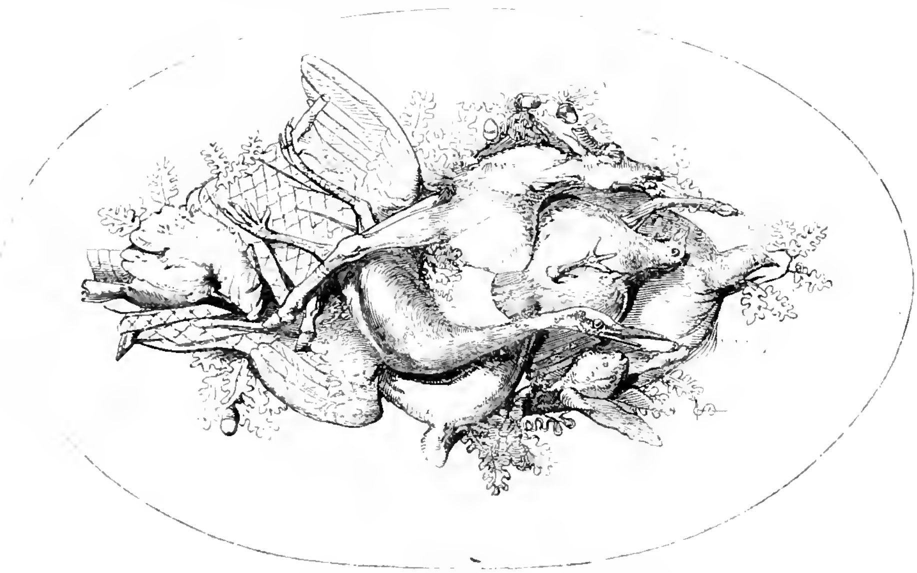


SPECIMENS OF BINDING:—THE PILGRIM'S PROGRESS, BY LEIGHTON AND CO.

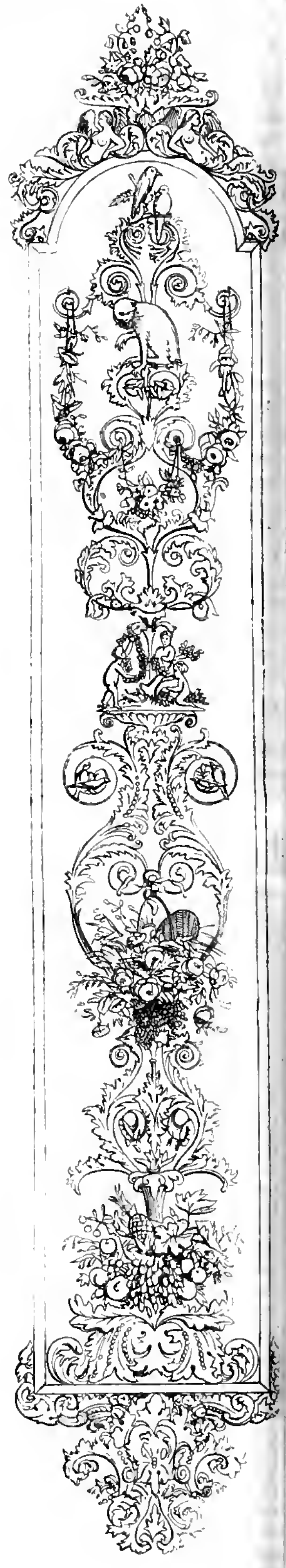
THE above is one of Messrs. Leighton's numerous specimens of fancy binding noticed in our article on "Bookbinding," No. 16, p. 242.

THREE SPECIMENS OF WALL DECORATIONS IN CANNABIC.—BY ALBANO.

"CANNABIC" is the name of a new preparation from hemp, intended to supply the place of *papier máché* and *carton pierre*, invented and patented by M. Albano. Whilst, perhaps, it has not



quite the softness of surface of the former named materials, it has the advantage of great durability, and of quickly drying. The material is strong, light, and impervious; it neither shrinks nor



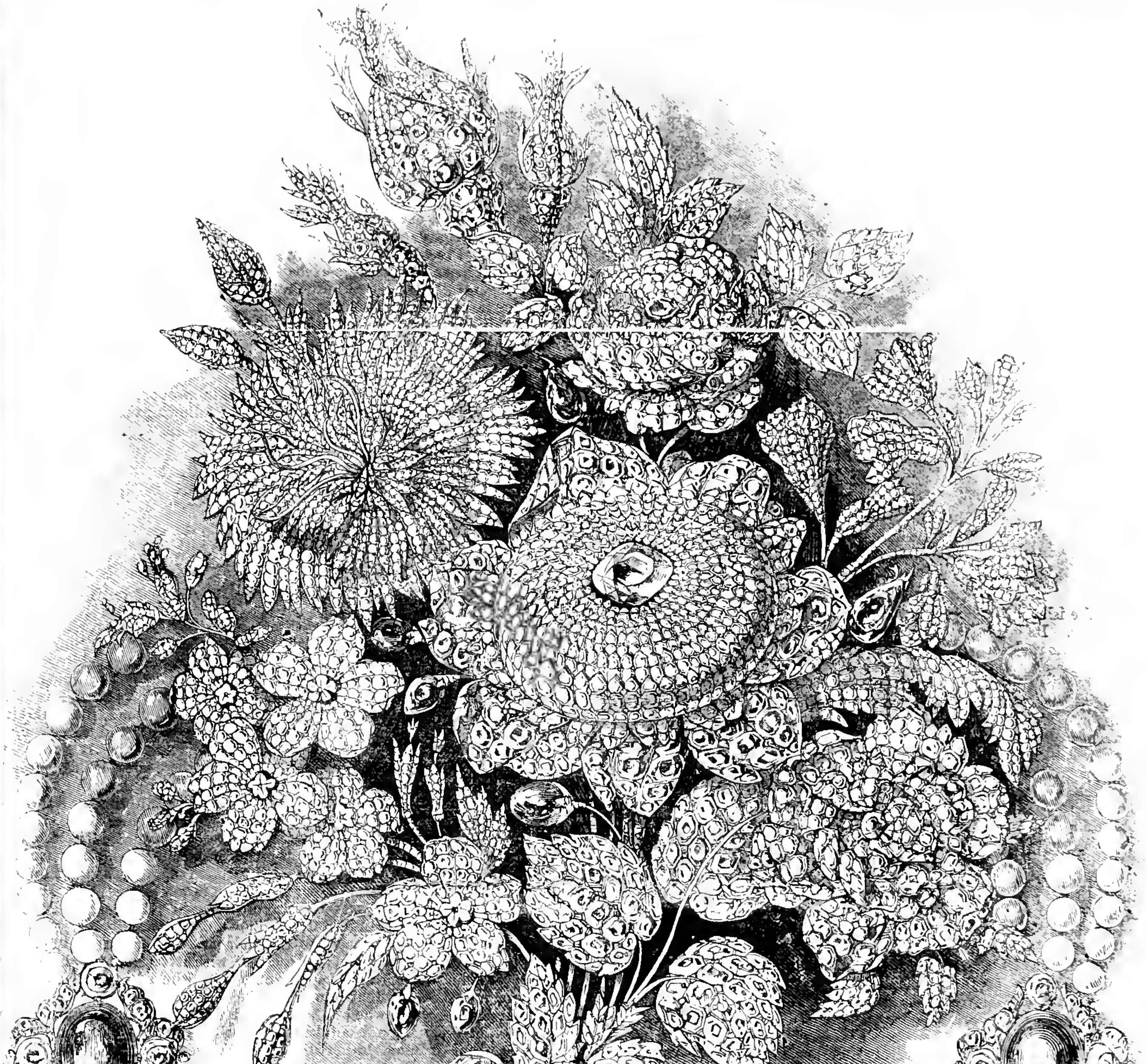
PANEL DECORATION.—BY HASELD

swells, and even the most intri designs possess perfect sharp and evenness: it is perfectly absorbent, and capable of the hig finish in colour or graining; and were told that its mellowness per it to be gilt and burnished equa the refulgence of solid metal.

It is equally applicable to exte as to internal purposes. It was used by M. Albano in the decora of Covent-Garden Theatre.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.



No. 19, February 7, 1852.

GROUP OF DIAMONDS, ETC.—HUNT AND ROSKELL.

Price One Penny.

MINING AND METALLURGY.

DIAMONDS AND MINERALS EMPLOYED FOR ORNAMENTAL PURPOSES.—No. III.

AMONG the minerals employed for personal decoration, the diamond evidently occupies the most prominent position, both on account of the beauty of the gem itself, and also because of its immense commercial value. The diamond, like charcoal, is composed of carbon; and, in a chemical point of view, differs from it only in being perfectly free from all traces of the earthy and other impurities with which the latter substance, even when most carefully prepared, is to a considerable extent contaminated. This mineral, although principally used in ornamental jewellery, is likewise applicable to many other purposes; in consequence of its extreme hardness it is now extensively employed for making the pivot-holes of the better description of watches; it has also been used in the formation of holes through which very fine metallic wires are drawn, besides furnishing the only convenient tool which can be employed for cutting glass.

The countries in which this gem has been yet discovered are far from numerous, the only localities in which it is found being the Indian peninsula,

Brazil, the island of Borneo, and Siberia, on the western side of the Ural mountains. Its geological position appears to be among diluvial gravel and conglomerate rocks or pudding-stone, consisting chiefly of rolled flint pebbles and ferruginous sand. India has from the most remote ages been celebrated for the beauty and magnitude of its diamonds, the largest and most valuable of which are obtained from the mines in the provinces of Golconda and Visapoor. The tract of country producing these gems extends from Cape Comorin to Bengal, and lies at the foot of a chain of mountains called the Orixa, which appear to belong to the trap-rock formation. The diamonds obtained from even the richest localities are rarely procured by directly searching the strata in which they are found, since they are commonly so coated with an earthy crust on the outside, as not to be readily distinguishable from the various other substances with which they are associated. For this reason the stony matter is first broken into fragments, and then washed in basins for the purpose of separating the loose earth; after which the residual gravel is spread out on a level piece of ground, where it is allowed to dry, and where the diamonds are recognised from their sparkling in the sun thus enabling the miners readily to discriminate between them and the stony matters with which they are associated.

The chief diamond mines of Brazil were discovered in the year 1728. The ground in which they are imbedded exactly resembles that of the diamond districts of India, and, besides containing fragments of coloured quartz and ferruginous sand, it produces small quantities of gold in connection with oligist iron ore. This conglomerate, or pudding-stone, which is seldom of any great thickness, occurs at considerable heights in the mountainous table-lands, and is entirely different from all the other mineral productions which are to be found in the vicinity. The principal mine of this part of the world is that of Mandagra, on the river Jigitonhonhra, to the north of Rio Janeiro, where the gems are obtained from the sand taken from the bed of the stream, after laying it nearly dry by drawing off the water during the dry season into large reservoirs prepared for that purpose. The "cascalho," or diamond gravel, which is then removed, is afterwards formed into little heaps or mounds of 15 or 16 tons each, where it remains until the commencement of the rainy season, when it is carefully washed in square boxes arranged under large oblong wooden sheds. A negro washer works at each of these boxes, and numerous inspectors are placed at regular distances among the workmen to prevent any abstraction of the diamonds by those who may chance to find them. When a negro finds a diamond, he immediately shows it to the inspector, and if its weight amounts to 17½ carats, or 70 grains, he receives his liberty.

The diamond is found crystallised in the octahedrous form, or in some other immediately derived from it. Its specific gravity varies from 3·4 to 3·6. It is not acted upon by any solvent, but, when strongly heated in air or oxygen gas, is consumed with the formation of carbonic acid.

The fracture of this mineral is foliated—its laminæ being parallel to the faces of the regular octahedron. When broken it divides in the direction of these lines; and this property of the gem is taken advantage of by the lapidary when reducing it to the forms best adapted for ornamental purposes.

Diamonds are usually colourless and transparent, but when coloured are frequently of a yellowish tint. Green diamonds are, next to yellow, the most common; blue specimens are also occasionally found, and although they seldom possess much lustre, are, in many countries, highly valued. Of all the coloured varieties the rose or pink diamonds are, however, by far the most esteemed, and sometimes even exceed in value those which are perfectly colourless—although, in general, the most limpid gems will be found to bear the highest price.

The art of cutting and polishing the diamond, although probably known in Asia in remote antiquity, was first introduced into Europe by Louis Bergher of Bruges, in the year 1456. The object is effected in two different ways—either by taking advantage of the natural laminæ of the gem, and splitting it in directions parallel to the faces of the octahedron, or by sawing it with a very delicate wire covered with diamond powder. By these processes, and more especially by the former, the diamond is so cut away that the weight of the finished gem is rarely more than one-half that of the rough stone from which it was made; and consequently the value of a brilliant-cut diamond is considered equal to that of a similar rough one of twice the weight, exclusive of the cost of labour expended in the workmanship. The weight and value of diamonds are estimated in carats, of which 150 are equal to one ounce troy, or 480 grains.

The difference between the exchangeable value of two diamonds of equal merit is generally estimated in the ratio of the squares of their weights; so that the value of three diamonds weighing respectively one, two, and three carats, will be as one, four, and nine. The average price of rough diamond is estimated at 2*l.* per carat; and consequently, when cut, the cost of the first carat, exclusive of workmanship, will be 8*l.*, which is the price of an uncut diamond of two carats.

The rapidly increasing value of diamonds in proportion to their weight in carats, will be readily seen by a glance at the following tabular statement:—

A wrought diamond of	. . .	3 carats is worth	. .	72*l.*
"	"	4	"	126
"	"	5	"	200
"	"	10	"	800
"	"	20	"	3,200
"	"	30	"	7,200
"	"	40	"	12,800
"	"	50	"	20,000
"	"	60	"	28,000
"	"	100	"	80,000

Beyond this weight such a method of calculation is not, however applicable, in consequence of the difficulty of finding purchasers for the more valuable gems.

Of the numerous diamonds exhibited, by far the largest and most valuable is the Koh-i-noor, formerly the property of Runjeet Singh, which together with two other specimens of the first water, were exhibited under a strong cage of gilt iron in the main avenue.* This jewel, which is the property of her Majesty, is one of the largest in the world, and is valued at 2,000,000*l.* sterling. Besides this magnificent diamond, the Exhibition contained a vast collection of jewels of inferior weight and value—among which may be mentioned a unique blue diamond, weighing 177 grains, the property of Mr. Hope, which was exhibited in the central gallery, near the great lump of gold from California, belonging to the bank of England.

Of the other large diamonds in the world the following are the most remarkable. That mentioned by Tavernier as belonging to the Emperor of Mogul, a now extinct kingdom, is said to have weighed in the rough state 900 carats; it was found in the Golconda mine about the year 1550 and is of the size of a hen's egg divided through the middle in the direction of its smallest diameter. Among the crown jewels of Russia is a diamond weighing 195 carats; it is of the size of a pigeon's egg, and was formerly the eye of the Brahminical idol Sheringham. Thence it was stolen by a French soldier who deserted into the Malabar service, and who found the means of purloining the gem; he escaped with it to Madras, where he disposed of it for 2,000*l.* to the captain of a ship, who afterwards sold it to a Jew for just six times that amount. The Jew subsequently disposed of it to a Greek merchant, who afterwards sold it to the Empress Catharine for 90,000*l.* in ready money and an annuity of 4,000*l.* The most perfect and beautiful diamond hitherto found is, however, probably that brought from India by an English gentleman of the name of Pitt, who sold it to the Duke of Orleans, by whom it was placed among the crown jewels of France. This jewel weighs rather more than 136 carats, and was sold for the sum of 100,000*l.* A model of a portion of the Nizam diamond—the remainder having unfortunately been chipped off—was shown in the Indian department. The manner in which the diamond was found, about twenty years since, in the Nizam's territory, is interesting. It was first seen in the hands of a native child, who was playing with it in ignorance of its value. The sum o

* For a full account of the Koh-i-noor, see No. 1, p. 6; and for engravings, see No. 5, p. 69.

ght *annas* having been offered for it excited the suspicion of the parents the child, and led ultimately to the discovery that the bright stone was real diamond. The diamond, after having passed through many hands, s purchased by a native banker for 70,000 rupees, and it is now in ssession of his Highness the Nizam. The stone is of an irregular oval ape; the length is 2·48, its greatest breadth 1·35, and its average thickss 0·92 inches. The actual weight of the Nizam diamond is 1,108 grains, ng equal to 277 carats of weight for the rough diamond; and as the gh stones are usually taken to give but one-half of their weight when and polished, we should have 138½ carats, or a weight between the t or Regent diamond (136¾ carats), and that of the Grand Duke of scany (139 carats) as the weight of the Nizam diamond. Had the mond remained entire, its weight when cut and polished would have n 155¾ carats, which would have placed it between the Tuscan and the at Russian diamond of 195 carats. From the circumstance of the Nizam mond not being polished, it is not known whether it is likely to prove

of pure water; but there is every probability that it is so, as the natives ndia are too good judges of diamonds to mistake a topaz for one; an additional proof of its value may be learned from the fact that a ve gave for the broken fragment a sum of not less than 70,000 rupees.

he diamonds coming from Brazil are usually smaller than those prod from India; but the mines of the former country annually furnish 10lb. to 13lb. weight of this precious mineral, of which from 800 to carats only are fit for jewellery—the remainder, under the name of t," being used for other purposes, such as the cutting of glass and the ding and polishing of precious stones.

mong the other minerals much prized by the jeweller may be mentioned apphire, which, when perfectly transparent and of a good colour, is as ly esteemed as the diamond. This gem is almost entirely composed of ina, the various colours of different individual specimens being occad by extremely minute admixtures of the metallic oxides. Those g a blue colour are known as Oriental sapphires, whilst others not g the same oxides in combination are differently coloured, and conently receive various distinctive names. When red, they are called tal rubies; when yellow, Oriental topazes; when violet, Oriental hysts; and when they are hair brown, adamantine spar.

e finest blue specimens of this gem have been procuced from Ceylon. most esteemed red varieties come from the Capelan mountains, in the dom of Ava; and smaller stones of the same kind are occasionally with in Saxony, Bohemia, and Auvergne. Amethysts are principally ght from the Carnatic, on the Malabar coast, and elsewhere in the Indies. The adamantine spar is chiefly obtained from the Malabar , but is less used than the other varieties for ornamental purposes. Of several kinds the red is by far the most valuable; a ruby of 3½ carats, perfect in form and colour, having been valued at the same price as ants having an equal weight.

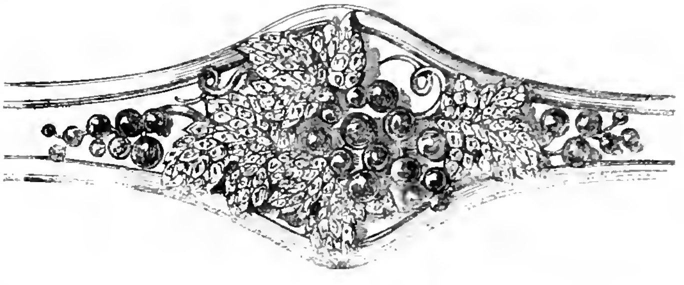
e emerald is a precious stone of a beautifully green colour, valued next e diamond, and in the same rank as the Oriental ruby and sapphire. curs crystallised in regular six-sided prisms, and has a specific gravity 0. In composition this gem may be considered as a double silicate of ina and glucina, mixed with variable small portions of iron and a little The most beautiful emeralds are obtained from Peru, where they in a kind of grey schist, mixed with greater or less quantities of nate of lime. A good stone of this kind, weighing four grains, is d at from 4*l.* to 5*l.*; and one of twenty-four grains realised, at the sale de Drée's cabinet, 2,400f., or nearly 100*l.* Some beautiful specimens s stone, both in the rough state and also after having passed through ands of the lapidary, were to be found in various departments of the Exhibition; more particularly in the collection of Professor Tennant, and in the case belonging to H. F. Thistlethwayte, Esq., which contained a very complete collection of gems and stones adapted for ornamental purposes.

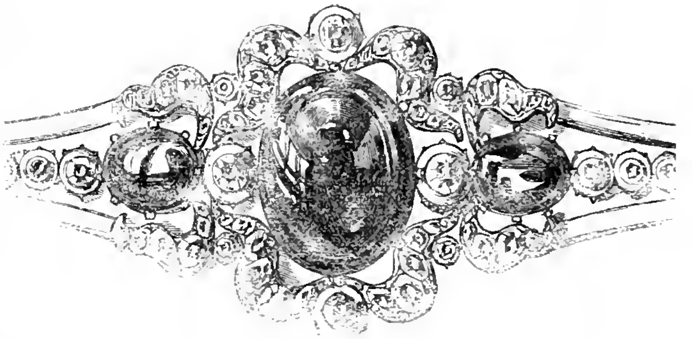
The garnet is a vitreous mineral belonging to the cubic system, and of which the predominating form is the rhomboidal dodecahedron. It constituents are silica, alumina, lime, and protoxide of iron. It is usually found disseminated in the primitive formations, and frequently occurs in gneiss and clay-slate. Garnets are abundantly met with in many parts of Europe, particularly in Germany; but those of Peru are the most esteemed.

The chrysolite, called "peridot," by Haüy and the French mineralogists, is probably the topaz of the ancients. It is the softest of the precious stones, being scratched by the file or a fragment of quartz.

Quartz, or silicic acid in a crystalline form, is also frequently cut for ornamental purposes, and, when limpid, and entirely free from flaws, is a very beautiful stone. When existing in the form of calcedony, and variously coloured by metallic oxides, the substance receives the name of cat's eye, plasma, chrysoprase, onyx, sardonyx, &c. It has a vitreous lustre, a conchoidal fracture, and a specific gravity of 2·69.

Among the numerous examples of this mineral, as adapted for ornamental purposes, may be mentioned various very beautiful stones from Cairngorm, in Aberdeenshire, both cut and in the natural state. A case containing some specimens of peculiar brilliancy was exhibited by Mr. Jamieson, of Aberdeen, and was placed near the western extremity of the space allotted to mineral productions. Some fine specimens in their natural state were





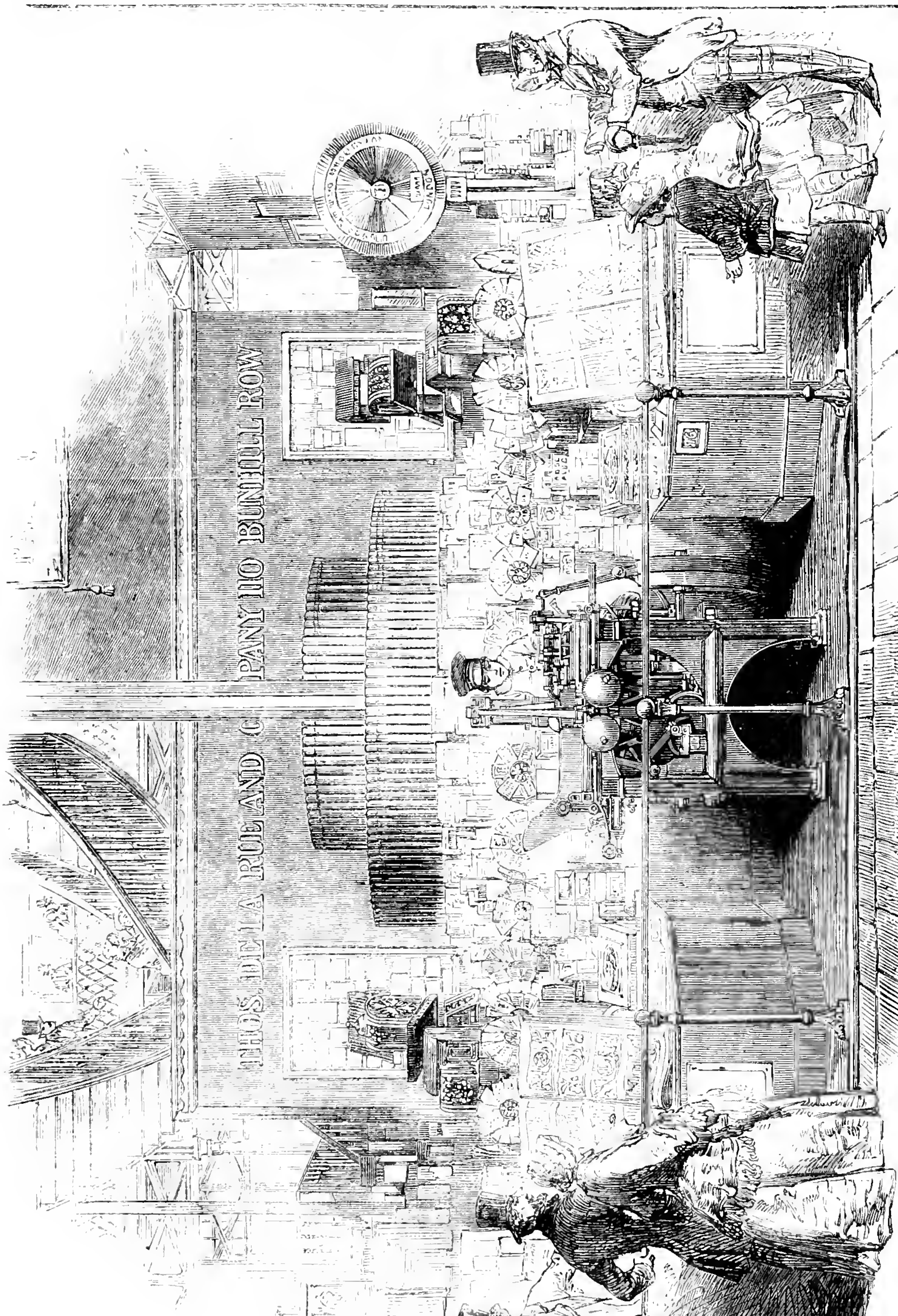
to be seen in the Highland stall of Mr. M'Dougall, in the gallery on the south side of the transept.

Opal, or uncleavable quartz, has a conchoidal fracture, with a resinous or vitreous lustre, accompanied by a strong play of colours. It occurs in kidney-shaped or stalactitic concretions, and has a specific gravity of 2·091. Hungary was long the only locality of precious opal, where it occurs in connection with common opal, in a sort of porphyritic formation. Lately however, some very fine specimens of this substance have been discovered in the Faroe islands; and most beautiful ones, sometimes quite transparent, are obtained near Gracias-a-Dias, in the province of Honduras, in America. The red, yellow, and other coloured varieties of opal are chiefly found near Limapau, in Mexico. In modern times, fine opals of moderate dimensions have frequently been sold at prices nearly equal to those obtained for diamonds of the same bulk. They are especially esteemed by the Turks, and are usually cut into a convex shape. A remarkably fine specimen was exhibited in the Russian department.

The value set on this stone by the ancients appears to have been very extraordinary, as Nonius, the Roman senator, preferred banishment to parting with his favourite opal, which was coveted by Mark Antony.

The turquoise, or calaite, is a massive mineral found only in the neighbourhood of Nichabour, in Persia, and is highly prized as an ornamental stone in that country. Its colour is a greenish-blue, but those varieties are most esteemed in which the blue predominates. It is composed of alumina, oxide of copper, oxide of iron, and phosphoric acid, and has a specific gravity varying from 2·83 to 3·00. There is also another totally different variety of this substance, known by the name of bone turquoise, which appears to be a phosphate of lime more or less coloured with phosphate of copper.

Malachite, or green carbonate of copper, is also frequently used for personal decoration. Russia, where it abounds, exhibited several magnificent specimens of its application to objects of furniture and room decorations. (See p. 304.)



DE LA RUE'S STALL AND ENVELOPE MACHINERY.

MISCELLANEOUS MANUFACTURES.

STATIONERY.

ON the north side of th western nave, near th Fine Arts Court, was th modest space occupied b this important group c manufactures, which, bu for the attractive foldin machine of Messrs. De R Rue and Co., placed at it portal, might have escape the scrutiny of all but th systematic visitor. Bool binding occupied th lion's share of the allotte grouud, and paper but very small portion. It to be regretted that ou paper manufacturers d not contribute more gen rally, for, uudoubtedl in many descriptions paper we stand unrivalle The number of contrib tors was in reality so sma that, had it not been f the energy of Messrs. V nables in collecting pape of many varieties and fro all sources, Great Brita would have made b little show in comparis with the productions our continental neig bours. Whilst on this su ject, we must advert to t advantage which wou have resulted from display of a paper mach in operation, with all modern improveme instead of the model hibited by the Mess Donkin—a name, ho ever, which must alw be mentioned in hono able connection with paper-making automat Here our French breth had the start of us, f instead of a model, th exhibited the paper-m ing machine of Varr Middleton, and Elwel a small one, it is true, a not at work. Had Messrs. Donkin avai themselves of the opp tunity of showing one their paper machines full work, the pul would have better app ciated the importance that art which transfo rags and refuse into tablet on which all results of human kn ledge are stored, and f for which the depend art of printing would useless.

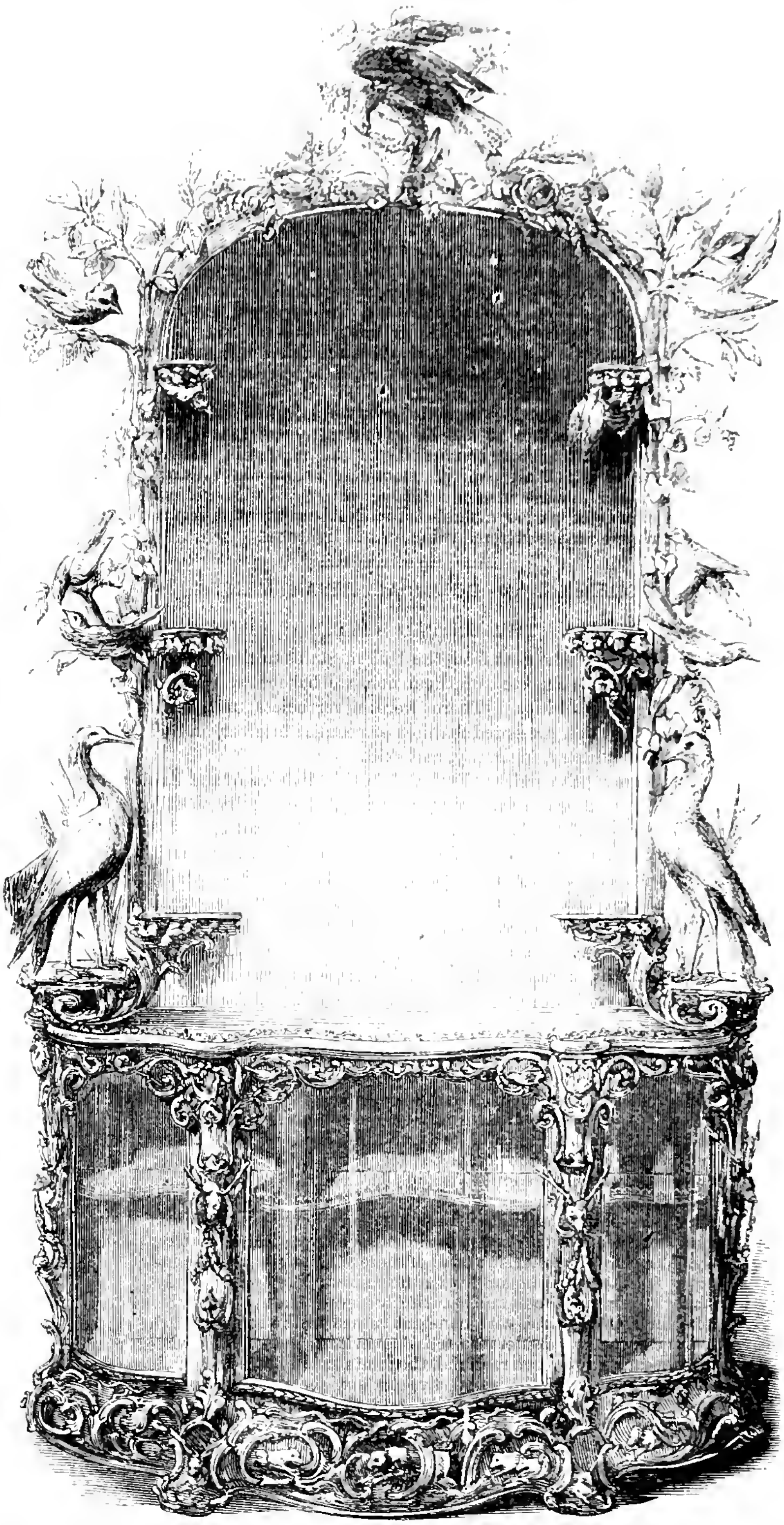
In Great Britain al about one hundred a thirty million pou weight of paper are an ally manufactured—e mated as worth upwa of three million pou sterling, and yielding the revenue 870,0

ne-tenths of this quantity are consumed in this country, the exports not amounting to more than 300,000*l.*; yet this noble art was represented by only some half dozen British exhibitors. Mr. Joynson of St. Mary Cray, and the Messrs. Spicer exhibited a roll of paper 2,500 yards in length; thus proving the perfection of the machinery which converts the water-suspended pulp, flowing continuously at one end of the machine, into an unbroken sheet of well sized writing paper, which comes out dried and ready for use at the other end. They also displayed a sheet of brown paper, 93 inches in width, and 420 feet in length, besides mill-boards of a new kind, and specimen reams of writing paper. Mr. Fourdrinier exhibited a sheet of pottery paper, two miles and a half in length. This paper is employed in the potteries as a vehicle to receive the impressions from the engraved plates, to be transferred therefrom by the burnishers to the unglazed ware. This class of paper is of great strength, and, in illustration of this, we may mention an anecdote which occurs to us. With this paper, twisted into a rope, the proprietor of one of our potteries repaired, rapidly and efficiently, the broken traces of a carriage which had conveyed a party of friends over the rough road leading to his works.

Mr. Fourdrinier's name must not be passed without paying a tribute to the memory of his spirited and energetic relatives, to whom is mainly due the perfecting of the first crude thought of the continuous paper-making machine. There were likewise specimens of pottery paper exhibited by Mr. Lamb, in connection with the rope used in its manufacture, and the pottery ware with the transferred designs; and some were also contributed by Mr. Saunders, of Dartford, who illustrated the strength before alluded to by suspending four half-hundred weights to a sheet only 20 inches in width. We here found Dewdney's well-known blue paper, which is used by the starch maker to wrap up his goods, and which must sustain the ordeal of a good baking in contact with the moist starch without losing its colour. Glazed boards, used in pressing cloths, were exhibited by Mr. Hamer, of Horseforth; also by Messrs. Hastings and Miller, who likewise display gun-wadding and brown papers. There were also brown papers from E. Smith, of Fellingshore. We have now enumerated the principal objects in the plain paper section, with the exception of those sent by Messrs. Cowan of Edinburgh, and the excellent and well-arranged selection of Messrs. Venables — which comprised, besides papers of their own make, most of the varieties manufactured in Great Britain, with the name of each maker prominently stated. Amongst them we noticed the universally celebrated drawing papers of Mr. J. Whatman and those of Mr. George Wilmot. There were also brown papers, in which the most highly polished steel goods may be safely packed without fear of rust; together with the unrivalled plate papers of Mr. Charles Venables, and the hand papers by his relative George Venables.

Of highly-glazed and tastefully packeted writing papers, Messrs. De La Rue and Co. were the principal exhibitors. Some of the novel papers with water marks, invented by Mr. Oldham, and manufactured by Mr. Saunders, were placed against the glass partition which divides off the machinery, and they produce effects very similar to the celebrated porcelain pictures, and will, we predict, receive ample patronage from the public. Among the water marks shown in the paper were some illustrations of sculpture from Nineveh, some Roman heads, the Madonna and Child, rural scenery, a medallion of her Majesty, the Exhibition building, with portraits of her Majesty and Prince Albert, a view of York Minster, and various others. The invention appears to be admirably adapted for paper for bank notes, and other descriptions in which security from fraud or forgery is desired.

Switzerland contributed well-made music papers, writing papers of tolerable quality, and white and tinted tissues, which are very inferior to those made in England. Rome sent remarkably good drawing papers, made by M. Millani; and Tuscany, good machine writing papers, pelure of good quality, and laid papers, in which there is still room for improvement. France came out well in tin papers. The well-known Mongolfier sent excellent tinted drawing papers, tinted and white printed papers, and a very remarkable description, called "*parchemin animal*," possessing surprising tenacity—so much so, that it is difficult to believe in its being only ordinary paper. Some of the specimens of this artificial skin are prepared with a kind of oil varnish, which adapts it for the preservation of artillery cartridges, especially during the long period of peace which it is our happiness to live in. The Société Anonyme du Marais (Seine et Marne) sent specimens of writing and printing papers, coarse papers used for the manufacture of paste-board, and likewise a fine sort of millboard employed as a substitute for pasted cardboard, but not possessing its strength and firmness. The Société Anonyme Soucle (Vosges) sent tinted writing papers, and tinted tissues, which would bear comparison with the best of our English manufactures—especially the pink, which surpassed in beauty of colour any other that we had seen. The French have always been famous for their tracing papers, especially those made transparent without the use of varnishes, and the samples here exhibited maintained their reputation. We now pause to examine more closely the splendid writing paper of Lacroix, whose thin post surpasses everything which we have seen. The influence which local circumstances —especially the postal arrangements of different countries— have on this



CARVED CABINET AND GLASS.—HANSON AND SONS.

branch of art cannot be more forcibly exemplified than in the paper productions of France as compared with our own. In England the aim is generally to produce a stout paper, that the writing may not show through on the opposite side. We certainly surpass all other countries in the beautiful laid or ribbed papers, which the French are only now attempting; whilst, on the contrary, we are far behind them in their writing

papers, as exemplified in M. Lacroix's beautiful and almost spotless pelure adapted to the postal laws of France.

Belgium sustained her reputation in this manufacture by a single, yet excellent, contribution from Godin and Son, exhibited in the northern gallery. It was most extensive, containing rolls of packing and printing papers, machine-made drawing papers, and pelure writing papers, which are very excellent, but which do not equal the specimens of M. Lacroix.

In the northern gallery Russia exhibited some packing, printing, and writing papers contributed by two mills, which show that that country is advancing, although their manufacture is still behind the Western States of Europe. Holland sent laid papers well adapted for account books, and likewise writing papers made by Honig and Son, all good of their various kinds; and Van Gelder and Sons exhibit paper, blue on one side and white on the other, for the use of sugar refiners.

There were several exhibitors from the different States of the Zollverein. We particularly notice the productions of the Mill of Dilligen, in Prussia. They contained, among other matters, specimens of the papers produced at these works from 1760 to 1850, showing at a glance the various improvements which have taken place: likewise a well-arranged group of raw materials, and the papers produced from them. We noticed particularly straw paper of excellent quality. A short time back a mill was started in England for manufacturing paper from straw, but the speculation does not appear to have answered commercially.

In the section of Sweden and Norway we searched in vain for the filtering paper so valuable to the experimental chemist, which is made with the water resulting from the melting of the mountain snows, and is said to be the purest of all papers. Denmark sent some vellum post of good quality, and likewise machine drawing papers. India exhibited some curious specimens of native manufacture; that contributed from Nepaul being remarkable for its extreme thinness and lightness.

FOREIGN AND COLONIAL DEPARTMENTS.

THE UNITED STATES.

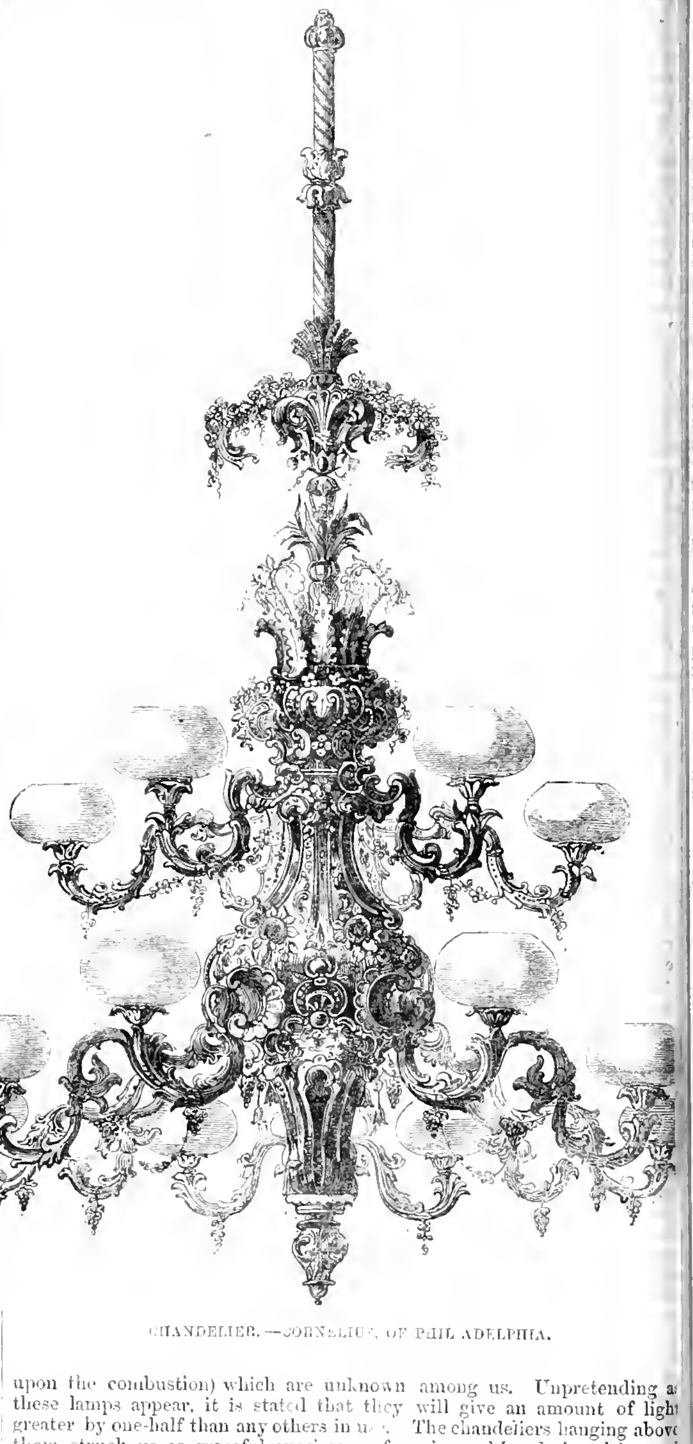
THE number of articles sent from the United States to the Exhibition was neither what was expected of them nor, we believe, did it adequately represent their capabilities. There were, nevertheless, many things in their collection which presented features of peculiar interest, and which do credit to their industry, ingenuity, and skill.

Foremost among the articles displayed in this division of the Exhibition were a coach, three or four waggons, "a buggy," technically so called, and a trotting "sulkey." We call these "foremost," because, both by the prominent place they occupied, and on account of the real merit of the vehicles themselves, they were really so. The coach—styled by the exhibitor a "carriola"—was a very creditable piece of workmanship, of good design, apparently most thoroughly well built, and finished with great regard to good taste. There was nothing of the gewgaw style about it. The colour, decorations, mountings, finish, and ornaments were all rich and neat. The carvings upon it were admirably well executed, and for symmetry and good keeping in every part, from the step of the footman to the board of the driver, it deserved high commendation. The wheels were much lighter than in carriages of a similar kind in England. This is claimed as a decided improvement. Certainly the appearance of the vehicle is improved by the absence of that bulkiness which gives a lumbering aspect to many an English carriage; and if the roads of our transatlantic brethren are not too rough to deal fairly with such wheels, we know not why they should be considered unsafe upon English turnpike roads.

The other vehicles exhibited were respectively entitled a York waggon, a Prince Albert waggon, a slide-top buggy, and a trotting sulkey. The chief characteristic of all of these was their extreme lightness of weight, when compared with their size. They were richly finished within and without, and beautifully carved; the upholstery being done in exceedingly good taste, with constant regard to the comfort of the rider, and exhibiting very considerable artistic merit in design. The wheels were made from carefully chosen material, the joints exactly fitted, the felloes (two in number, instead of the usual five or six, for greater strength), confined by a steel insertion and bolts, and the axletrees exceedingly neat and strong. It is claimed for these axletrees (an American invention) that, in loss of friction, strength, freedom from all noise in motion, and cleanliness, they are superior to any in England. Several of these lighter carriages are now in use in this country, and give great satisfaction; and several more of a similar manufacture have been recently ordered from New York. Indeed, it is not difficult to understand why they should become favourites out of London; nor how reluctantly a lover of quick driving would return to the heavier vehicles of city manufacture.

There were several sets of harness, both single and double, among the articles exhibited, which deserve notice. That exhibited by Messrs. Lacey and Phillips, was a rich and elegant specimen of manufacture. It was made from leather of the first quality, and with perfect thoroughness of work. The mountings were of solid silver, with appropriate and graceful designs. In this, as in all the other harness shown, there was remarkable lightness and airiness, and an obvious endeavour to do away with all superabundance of weight.

In a bay, in the main aisle, upon the south side of the building, were two chandeliers and several lamps, from the manufactory of Messrs. Cornelius and Co., in Philadelphia. The great use of oil in the United States has led to many improvements in lamps—especially in those upon the solar principle, as it is called (where increased draught is made to bear



CHANDELIER.—CORNELIUS, OF PHILADELPHIA.

upon the combustion) which are unknown among us. Unpretending as these lamps appear, it is stated that they will give an amount of light greater by one-half than any others in use. The chandeliers hanging above them struck us as graceful specimens of workmanship, designed in good taste, and showing a crystal purity of glass. The casting was remarkable for its fineness, sharpness, and uniformity. The branches, formed by arabesque scrolls, profusely ornamented with birds and flowers, delicately sculptured or in bold relief, with centres of richly cut glass, claim particular approval for their elegance and lightness of design. This is among the youngest branches of manufacture in the United States, it being scarcely fifteen years since every chandelier, girandole, mantel lamp, and candelabra used in that country was imported from Europe; and it argues considerable enterprise and perseverance, on the part of the manufacturers, that they have attained

so much excellence as to be willing to vie in the Exhibition with the oldest and most celebrated houses in the world.

On the south side of their portion of the building, the contributors from the States exhibited, under the general classification of raw material, many very excellent specimens. There were among these a large variety of articles, such as Indian corn, ground, hulled, and in the ear; rye, oats, barley, wheat, rice, cotton, tobacco, minerals, chemicals, woods, brooms, beef, pork, lard, hams, and almost everything else identified with the productions of that country. Next in order were to be seen daguerreotypes, paintings, herbaria, and prints, with some samples of stained glass suspended from the galleries, and cottons, carpetings, wrought quilts, calicoes, and needlework, tastefully displayed around. Considering the distance from which these had to be conveyed, not only across 3000 miles of ocean, but often from little short of that distance inland—and considering, too, that it is not in her manufactures that America makes her chief impression upon the world—we regard this portion of her exhibition with great interest. In pianofortes there was a show highly creditable to the manufacture of musical instruments in the United States. Pierson exhibited a seven octave grand pianoforte; Chickering a semi-grand, and other instruments of less pretension but of much merit. There were two from the manufactory of Conrad Meyer, of Philadelphia, in neat and very unpretending cases, combining all the best qualities of the highest rank of pianos. In breadth, freedom, and evenness of tone, in promptness and elasticity of action, and in a combination of everything that is rich and sweet in this description of instrument, he claims to be unsurpassed.

Among cordage, boats, oars, and models of favourite ships, were exhibited two ship-ventilators, by Frederick Emerson, of Boston. These are intended to supersede the ordinary wind-sail now in use for sending pure air into the recesses of ships. The inventor has given much attention to the subject of ventilation, and his success has been honoured by several gold medals in the United States. How far this application of his invention may be superior to the methods now in use for the same purpose is uncertain. In the minds of sailors there is always an objection to fixtures above deck, which would be likely to impede their general introduction.

Together with daguerreotypes, before alluded to, there were exhibited camera obscuras by C. C. Harrison, of New York, the results of which, in the pictures that hung above them, were exceedingly favourable. There were shawls from the Bay State mills, of beautiful colour and a high perfection of manufacture; white cotton goods, which, in bleaching, finishing, and putting up, appeared equal to Manchester products; some very beautiful flannels, single milled doe-skins and wool-black cassimeres of thorough fabric; tweeds, well mixed and of good colours; a salamander safe, well made; Newell's improved bank lock, ingenious and well executed, (which will be noticed under the head of "LOCKS;") a patent paying machine for pitching the seams of vessels, the box being provided with a ventricle wheel, which receives the hot melted material, and applies it neatly, economically, and directly to the seam to be covered; an air exhausted coffin, with glazed aperture at top; car wheels for railroads, wood and cork legs, clocks, watches, dentists' tools and works, India-rubber goods of various forms, mathematical and solar instruments, a self-determining variation compass, trunks, boots and shoes, hats, specimens of printing and binding, together with pistols, rifles, and other weapons of offence and defence. Of these rifles, manufactured by Robbins and Lawrence, it is but just to say that they are among the best, if not *the* best, of any rifles manufactured in the world, the Americans claiming to excel in this species of manufacture. They are made from the best selected opake cold blast forge iron, and are of an unpretending style, but remarkable for a plain, substantial, and perfect finish; they are strong, simple, and thorough in their workmanship, and eminently adapted for real service. Colt's revolvers will be noticed in our article on "ARMS AND ARMOUR."

Two bell telegraphs, exhibited in the central avenue, very deservedly attracted much attention. The bell telegraph, otherwise called an 'annunciator," is an invention made to supersede the awkward array of bells in houses and hotels. It is an extremely neat and beautiful article, and indicates whence the bell was rung, by uncovering a number corresponding to the number of the room; and this, too, for any length of time afterwards, until, by the touch of a spring, the number is re-covered. In the large hotels in the United States, and in many private residences, it is much used.

In the moving machinery department, among other objects of interest from the United States, was a machine exhibited by Mr. Charles Morey, called a stone dressing machine. A machine for dressing stone by power has long been regarded as a great desideratum, and has been the object of many expensive, though unsuccessful experiments. One great difficulty has been found in making the cutting tools of a quality to stand the action of stone, unless at such cost as to render their use unprofitable. This difficulty is overcome by the present invention, which consists in the employment of chilled cast-iron burrs, or rolling cutters. Iron, as is now known, may, by a peculiar process of chilling in casting, be converted to a diamond hardness, that perfectly fits it for reducing, with great facility and economy, the surface of stone. The burrs made in this way retain a sufficient degree of sharpness for a long time, and can be maintained at a small cost, being wholly formed and finished in casting. In dressing circular forms, the stones are made to revolve, when the burrs, which are mounted in sliding rests, are brought into action. For straight surfaces, however, the stones are laid upon a transverse bed, and the cutters, mounted upon a revolving cylinder, are placed above them. The burrs or cutters are so arranged as to turn freely on their axis when brought in contact with the stone, and as they roll over it, they crush it away in the form of scales and dust. By varying the shape and arrangement of the burrs, ornamental surfaces may be produced.

Among the agricultural implements exhibited which claim the attention of agriculturists particularly, are reaping machines, ploughs, cultivators, fan mills, and smut machines. The American reapers are worked by a single span of horses abreast, with a driver and a man to rake off the grain as it is cut down by moveable knives. On land free from obstruction, these reapers will cut from twelve to twenty acres of wheat in a day, depending somewhat upon the speed of the horses and the state of the grain. The grain is left in a proper condition for the binders, who follow after the machine, and the grain is cut quite as clean as by any other method, either by the sickle or the cradle. M'Cormick's Virginia reaper (already described by us), is in very general use, 1,800 machines having, we believe, been sold in the United States in 1850. Hussy's reaper (also already described by us), is in general use, and operates remarkably well. These implements will enable the farmer to gather his crop in a very short time, securing the wheat and other grain at the very time it is in proper condition for harvesting, thus avoiding the alternative to which he is now obliged to resort, of harvesting a portion of his field before fully ripe, and a portion after it is too ripe to make the best flour. In point of economy they are very important, reducing the expense very much from that of the ordinary methods. In a climate as variable as that of Great Britain, the importance of these reaping machines must be apparent—enabling the farmer often in a single day to secure a crop which otherwise might be materially injured by the unfavourable state of the weather.

The ploughs exhibited are of various sizes, and adapted to various purposes, but have been already described. The cultivators exhibited appeared to be convenient and useful implements, at very moderate prices. The fan mills for cleaning grain are believed to possess some properties which are not found in those generally used—cleaning grain which is damp most perfectly. The smut machines exhibited were made of iron, very compact, very durable, easily repaired, and warranted to clean from 15 bushels to 150 bushels per hour, according to the size of the machine. These implements are in very general use in the United States and in Canada, and are worthy the attention of all who are engaged in milling grain.

ARCHITECTURAL MEDALS.—BY WIENER.

M. WIENER, of Brussels, exhibited a very interesting collection of medals, with views of cathedrals and other public buildings in Belgium. That which we engrave (p. 300) is of the Exchange at Liège, formerly the bishop's palace.

CARVED CABINET AND GLASS.—BY HANSON AND SONS.

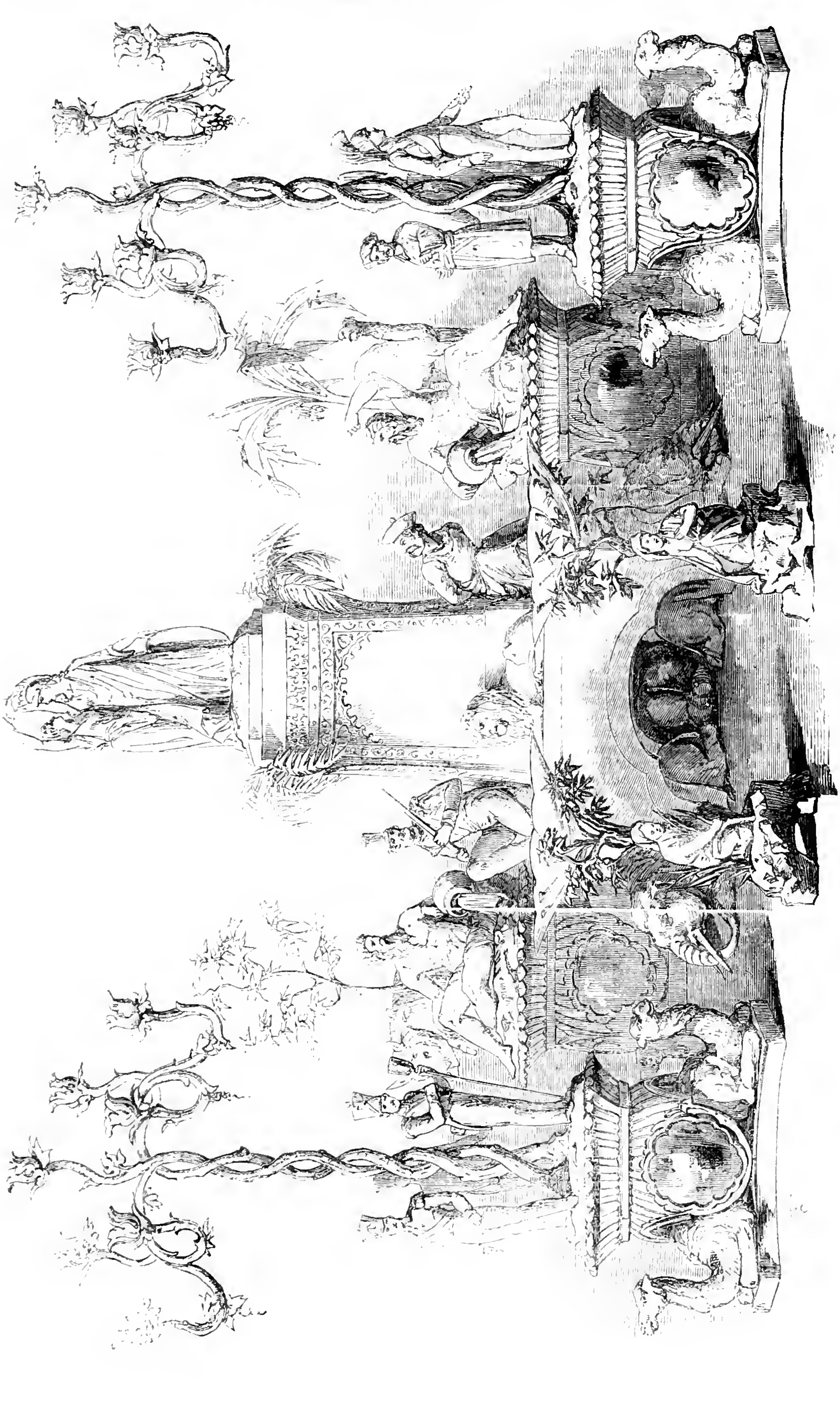
AMONGST the choice and beautiful specimens of carving produced by British skill, we noticed, as especially calling for praise, a very elegant commode or cabinet, by Hanson and Sons. In form it is well adapted both for utility and ornament, with considerable originality of outline. The carvings on the cabinet represent a wild boar hunt, which reminds one of the fire and energy of Snyders. On the frame of the glass are a number of birds, very naturally designed: the wary hawk securing his prey, the chattering jay, the cunning magpie, the twittering wren, the swift martin, the welcome cuckoo, the warbling blackbird, the lonely bittern, and the light and graceful egret, are all wrought with great accuracy of character and most delicate detail. (See p. 293.)

JEWELS.—BY HUNT AND ROSKELL.

IN a former number we gave an engraving of the magnificent diamond and ruby stomacher exhibited by Messrs. Morel in the Crystal Palace; and in the present sheet we give several specimens from the costly and elegant assortment exhibited by Messrs. Hunt and Roskell. The principal and all-attractive object in the group is a magnificent diamond bouquet, exhibited as a specimen of the art of diamond setting. The flowers (comprising the anemone, rose, carnation, &c.) are modelled from nature. This brilliant structure divides into seven different sprigs, each perfect in design; and the complicated flowers, by mechanical contrivances, separate for the purpose of effectual cleaning. In the production of this costly work nearly 6000 diamonds have been employed, the largest of which weighs upwards of ten carats, whilst some of the smallest, in the stamens of the flowers, would not exceed the thousandth part of a carat. (See p. 289.)

The next object of importance is an ornament for the head, composed of branch coral, ornamented by leaves of enamel and gold, enriched with diamonds—a very elegant production, of chaste effect.

At the sides were several brooches, bracelets, and other ornaments, enriched with diamonds and other precious stones; not the least curious amongst them being some specimens of ear-rings in emeralds, diamonds, carbuncles, &c., after the sculptures from Nineveh. (See p. 291.)



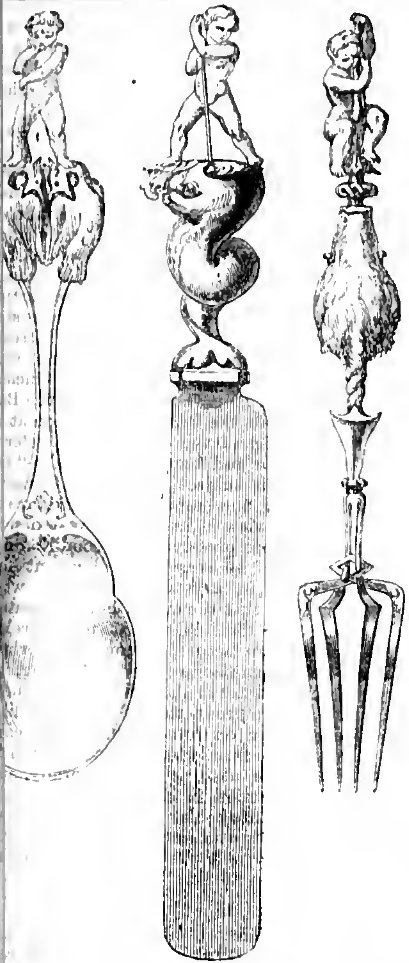
THE ELLENBOROUGH TESTIMONIAL.—SILVER SERVICE.—HUNT AND ROSKELL.

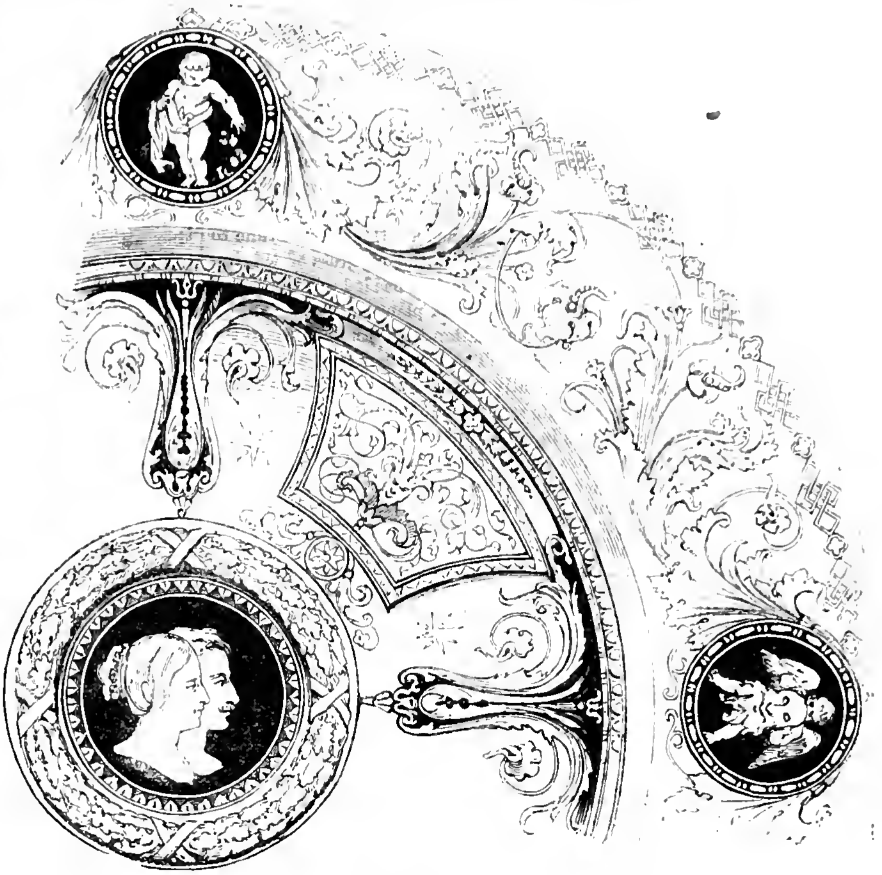
THE ELLENBOROUGH PLATE.

AMONGST the magnificent works in silver exhibited, by the house of Hunt and Roskell the service of plate (or portions of one) presented to the Earl of Ellenborough, by his Lordship's friends in India, occupied a prominent position, and commanded attention on account not only of the beauty of the compositions themselves, but the historical events which they commemorate. The principal object is an ornament for the centre of the table, of massive monumental character surmounted by two figures, typifying Asia crowning Britannia. The *bassi relievi* present four subjects—the ratification of the treaty of Nankin, and views of Calcutta, Cabul, and Canton. On the base are figures of Affghan and Chinese captives and of a British sepoy. The architecture is of Indian character, embellished with palms and supported by recumbent elephants.

NEW PATTERN FOR DINNER PLATE. — FELL AND CO.

ON the opposite page is a pattern of a new dinner plate of common earthenware, contributed by Messrs. Fell and Co., St. Peter's Pottery, Newcastle-upon-Tyne. It was devised at the Newcastle School of Design and is called "the cinque-cento Queen and Prince Albert pattern." The ornamentation is very beautiful *per se*, Italian in style, the scroll-work of the rim being extremely light and graceful. The decorations of the centre are highly ambitious, and are finished with care, but we doubt if they will ever become so popular as many old patterns. The eye should not be tasked to a too critical observation of details, in a vessel of daily requirement, more particularly when its use is to minister to the craving of another organ of sense, whose claims for the moment should be paramount. Nevertheless, we would by no means discourage the enterprising spirit which has led to the production of this very





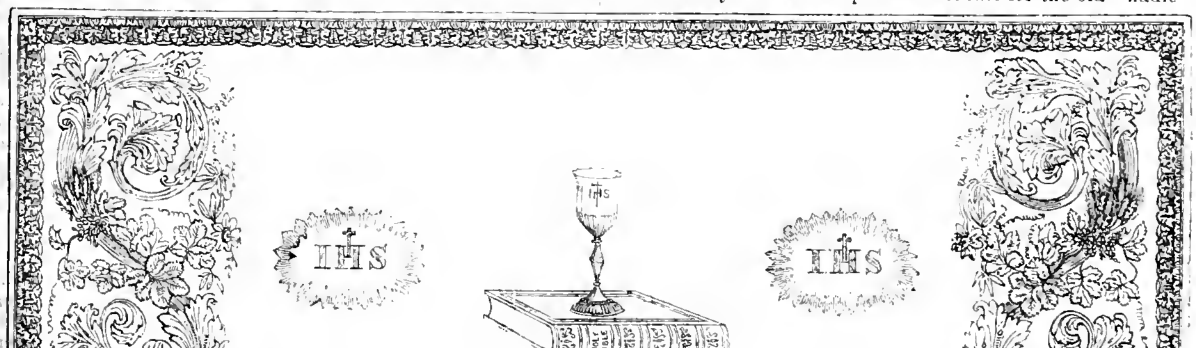
NEW PATTERN FOR DINNER PLATE.—FELL AND CO.

FORK, AND SPOON.—LAMBERT AND RAWLINGS.

te piece of composition; the same industry and expense applied simpler subject may be happier in its results. It remains to ed of the colouring, that the ground of the circular parts is ver- and painted by hand; in other respects it would not be a costly

KNIFE, FORK, AND SPOON.—BY LAMBERT AND RAWLINGS.

WHILST Messrs. Fell and Co. try to improve our appetite for dinner by the introduction of a new plate, Messrs. Lambert and Rawlings present us with a knife, fork, and spoon, of novel and fanciful device, emblematic respectively of fish, flesh, and fowl, three out of the "four elements" (vegetable alone being unrepresented) of which the humblest repast and the most *recherché* combinations of the *cuisine* consist. They will bear and repay inspection—between the courses. Messrs. Lias also exhibit a specimen of table plate of a simpler fashion, ornamented with a handsome scroll, and which they consider may form an acceptable substitute for the old "fiddle" pattern.



DAMASK COMMUNION CLOTH—PEGLER.

TEXTILE MANUFACTURES.

FLAX.

OF the various manufactures illustrative of the industry and resources of this country which were collected in the Great Exhibition, there were none—cotton not excepted—which deserve a large amount of attention, or which were more interesting as connected with our national prosperity, than the display of our linen manufactures. The deficient supply of the raw material for our textile manufactures has tended at the present time to cause a deeper interest than formerly to be felt in the progress of this important staple branch of our industry; and this feeling has led to a closer and more minute inquiry into the structure of the flax plant, and its capability for adapting itself, either alone or in combination with other fibres, to the production of new and improved fabrics. The results of these inquiries and researches have been to give a greatly increased importance to everything relating to the growth, preparation, and manufacture of flax.

One of the most important points in connection with the linen manufacture of this country is that the raw material may be produced with profit and advantage by our own agriculturists; indeed, from first to last, it is one which may be carried on quite independently of the precarious supplies of foreign countries. The objections which were formerly entertained to the growth of flax, for its supposed deteriorative or exhaustive properties, have, in consequence of the discussions which have recently taken place on the subject at the meetings of the council of the Royal Agricultural Society, together with the published results of the experience of many of our most enterprising agriculturists, been completely removed. There is also every prospect that, with the removal of the difficulties hitherto attendant on its preparation for sale—by means of processes which will be hereafter alluded to—the remaining objections to the cultivation of the flax crop will be shortly added to that formidable list of prejudices and objections which have been made to disappear before the progress of knowledge and science. The effect of these objections, however, as shown in the neglect or refusal of our agriculturists to devote any considerable portion of their land to flax culture, has not been without its serious effects alike upon the producer and consumer of the article. In the one case, the farmer has lost the profits and advantages which he would otherwise have derived from its culture, and he has become dependent upon the supply of foreign countries for one of the most indispensable articles of his cattle food, which he might have obtained from his own soil: while, upon the other hand, the manufacturer has been cramped for the want of raw material, and has been compelled to purchase it of foreign countries at higher prices, and in a condition which, in many cases, has been unsuitable for his purposes.

The consumption of flax in this country for manufacturing and agricultural purposes has been for the last twenty years rapidly increasing; and almost in the same proportion in which the skill and enterprise of the manufacturer have augmented the demand, the supply from home sources has diminished. The quantity imported in 1831 was 936,411 cwts.; in 1841, 11,346,843 cwts.; in 1845, 1,418,323 cwts.; and in 1849 it amounted to 1,806,786 cwts., or nearly double that of 1831. Official returns show that a sum of not less than nine millions is at present annually paid to the importers of foreign flax, and of oil-cake formed from it.

For a long period the linen trade of Ireland was fostered by considerable bounties, which but a few years since were entirely removed; and, although subjected to severe competition with other countries, and having a duty of 40 per cent. imposed upon their productions by their former largest consumer—France—the Irish manufacturers have not only kept their ground, but have made a progress proportionably equal to any which had been made in the cotton trade. If we compare the prices of linen in 1832, when the home market was secured to the manufacturer, and in which year the bounty system ceased, with the prices in 1849, they will show a reduction of nearly 50 per cent. The same quality which in 1832, sold for 1*s.* 4*d.* per yard, sold for 8¼*d.* in 1849, and that which had brought 2*s.* 5*d.* was sold for 1*s.* 3½*d.* Passing from the manufacture of linens to cambric handkerchiefs—a branch of industry which has made the most rapid progress in Ireland—we shall find upon comparing the prices of the same periods, a reduction during the fifteen years from 1833 to 1848, of about 60 per cent.; and in the ten years, 1838—48, of 47 per cent. Thus, cambric handkerchiefs which sold in 1833 for 8*s.* 3*d.* per dozen, and for 7*s.* in 1838, sold for 2*s.* 10*d.* in 1848: while, in the best qualities, we find that those which sold for 35*s.* per dozen in 1833, sold for 28*s.* in 1838, and for 18*s.* in 1848.

This reduction in price has been mainly effected in the spinning process—the old mode of hand spinning having been very generally superseded by steam power. The reduction in price of linen yarns during this period, as compared with cotton, has been nearly 40 per cent. in favour of the former; and it would appear that the time is not far distant when the linen manufacturer will be enabled to produce from flax a fabric cheaper and more durable than can be obtained from cotton. Notwithstanding, however, the great decrease in price which has taken place in linen, still the consumers of this country are benefited by it to a comparatively small extent, for by far the greater proportion of the linen manufactured is exported to foreign countries. That which was formerly a domestic branch of industry, the material of which was grown, spun, and wo[ven by] the people of this country, has now, to a great extent, become a fo[reign] one, relying upon the raw produce of, and exporting the finished fabr[ics to] foreign countries. The reason of this is to be found in the diminished [price] at which cotton fabrics can be supplied to the consumer.

The anomalous position in which the linen manufacturer is placed—em[ploy]ing, as he does, a raw material which can be produced at less than on[e-half] of the price at which cotton can be profitably imported, and yet ob[liging] the home consumer to pay more than double the price of cotton for the [fabric] produced from it—is a subject to which we are happy to see that con[sider]able attention has lately been paid. This great increase of pric[e, so] injurious to the extended employment of linen, is mainly to be trac[ed to] the employment of inefficient and expensive processes in its prepar[atory] stages of manufacture, to which we shall have occasion more partic[ularly] to refer when noticing the specimens of the flax in its various sta[ges of] manipulation. All that appears to be wanted, in order to increas[e the] consumption of linen to an almost inconceivable extent, and to ren[der it] a most valuable auxiliary to our cotton manufactures, is some efficien[t and] economical mode of preparing the fibre. Mr. G. R. Porter, of the Bo[ard of] Trade, in an excellent paper, read before the British Association at i[ts] meeting in Edinburgh, on the statistics of the cotton trade, referr[ing to] the advantages of increased flax culture and manufacture, said—"It [must] not be for a moment imagined that this subject is brought forward [from] any desire of fostering or encouraging one branch of manufacture a[t the] expense of any other. The object in view is, in fact, the very oppo[site of] such a desire, and springs from the wish to preserve in its condition of [pros]perity and progress one of the chief sources of employment fo[r our] continually-growing numbers, without in any way interfering wit[h any] other branch of industry. It is hoped that the means here indicate[d may] be found efficacious for meeting the difficulties that now threat[en to] obstruct the course of the cotton manufacture, without interfering [with] or creating difficulties for the linen manufacture, by transferring, i[n part,] the labour now bestowed upon one material to the conversion of the [other.] This could not be accomplished, if the production of flax were, lik[e that] of cotton, in any great degree dependent upon the accidents of the seas[ons in] one particular country—a disadvantage from which the cultivation [of flax] has always been free, while, of late, the obstacle which, morally, at [least,] stood in the way of its extensive production in the United Kingdo[m, has] been made to disappear from our statute-book. The adoption of [flax as] an auxiliary, by our cotton manufacturers could not work any injury [to the] linen trade, since it would only make good the deficiency, if and [when it] should arise, in the production of cotton fabrics."

CAMBRICS.

THE cambric trade of Ireland has improved from time to t[ime to] such an extent, that for some years past it has been questionable w[hether] or not the largest amount of those productions sold at English mar[kets as] French cambrics are not produced in Ireland. In the article of [pocket] handkerchiefs alone, it is quite certain that many tons' weight per [annum] of unbleached Irish cambric finds its way to France for the pur[pose of] bleaching; but it is a singular fact, that it never appears to be re[turned] when that operation is effected. It will, of course, be readily unde[rstood] that, in a delicate fabric like this, the peculiar atmospheric advantag[es of a] country like France would be invaluable in the bleaching process; b[ut that] the operation constitutes the manufacture of the article, is a species [of logic] we have never yet been able to comprehend. In short, it seems [very] clear, that French cambrics are generally made in the north of I[reland.] The exhibition of this article was confined to three or four exhibitor[s. Mr.] J. Malcolm, Lurgan, Ireland, showed beautiful specimens of linen, ca[mbric,] and clear lawns, as also shirt frontings, and hem stitched handke[rchiefs;] all being of a very superior quality. Messrs. J. and T. Richardson, [of] Lurgan, exhibited cambric handkerchiefs, printed and plain, the [designs] being neat and elegant. Mr. John Henning, of Waringstown, Co. [Down,] exhibited largely in cambrics, particularly ladies' dresses, many of [which] are tasteful and appropriate.

PLAIN IRISH LINENS.

LITTLE need be said on the qualities of the examples of this [useful] and beautiful article, since description as to these points is imp[ossible.] We remarked a very beautiful selection of linens of all qualitie[s exhi]bited by Messrs. Sadler, Fenton, and Co., Belfast. These were [of a] superior character, according to quality, and were tastefully dis[played] both individually and as a whole; nor should the specimens shown [by Mr.] Jonas Wilks, Watling-street, London, and Mr. Sadler, Ironmonge[r-lane,] London, be passed by. Each was complete in itself, and contained [some] excellent examples of this staple manufacture of the north of I[reland.] There were many other English exhibitors in this department, b[ut we] cannot enumerate them all.

LINEN DAMASKS.

THE manufacture of linen damasks has been carried to a great ext[ent in] the north of Ireland, and its future development is likely to be i[ncreased] by increased attention to design as applicable thereto. The inventiv[eness] and genius of the Irish people in matters of taste have never been [ques]tioned; its direction to useful and profitable purposes may now be t[urned] to account, if the past be taken as any basis for probabilities as [to the] future. With the patronage bestowed on the higher class of damask[s, this] can scarcely fail to be the case; the great object, however, will be

the talent and opportunity are properly used, and that the ancient ation of the district is sustained in its competition with the produc of other countries.

e damask linen trade was first introduced with full and complete by the late Mr. William Coulson, of Lisburn, about 1768, and, from late to the present time, the business has been carried on by his ndants at that place, and has spread itself to other places, and it now s one of the staple trades of Belfast.

o Coulsons, William and James, both of Lisburn, but distinct houses, ited a very excellent selection of damasks. Mr. James Coulson's oth extensive and highly creditable to his skill and enterprise; nor we be too severe if the taste was not always unexceptionable, since vague and indefinite notions exist as to the proper decorations of loured fabrics of all kinds. The larger cloths were bold and effective atment; but the drawing was by no means so good as it might be. was, too, a considerable amount of crowding together of all sorts blems, heraldic, national, and allegorical. Several of the smaller cloths were of superior character in this respect.

William Coulson's display was also a satisfactory one in a manufac- g point of view. The cloths were admirably made, and, on the whole, esigns were executed with greater skill than the taste in which they nceived is legitimate. The napkins woven on linen and silk were effective, but the napkin with the figure of Britannia with the guns umpets would have been better if these had been left out.

Michael Andrews, of Ardoyne, near Belfast, sustained his reputation e not very extensive exposition he made of the higher quality of ks, for which his house has been so long noted. His double damasks abrics of great excellence, and in many respects the patterns are elected. His cloth, which he calls the "Exhibition pattern," is on hole well and effectively designed. It is not too much crowded with , and the effect tells well, being distinct and to the purpose. The ndon pattern, a large and costly example, is a specimen of Irish k manufacture, prepared for the Royal Flax Improvement Society lfast, as part of a testimonial to the present Lord Lieutenant of d, as a mark of the estimation in which his services are held in the , in the promotion of flax cultivation and the general improvement ustry. This example is a very excellent one of the heraldic school, t running into the extremes of which we have complained, in the ading of emblems and insignia; the introduction of the shamrock e flax plant being remarkably pretty and effective.

John Henning, of Waringstown, exhibited very largely. Some of maller table damasks were especially noticeable for their elegance, e taste in which they are designed. There was no attempt at too and that which has been aimed at has been realised. The drawing patterns, too, is correct and artistic. In the larger examples, we ed the fault already complained of in others—bringing together ts which would have been better avoided. The "Portland vase" is admirable as a specimen of weaving. The ornamental portion, well arranged and appropriate; but the vase is out of place, and so bas-reliefs. These are not fitting decorations for textile fabrics, hould be avoided. The Moresque or Alhambra design has some nt points and is effective as a whole, the border being especially The Egyptian design is not Egyptian in style, since that is geome- aper-work; and the Gothic design is a mistake in principle; the acle-work of a cathedral is not the type to adapt to weaving. Mr. ng should pay more attention to these points, since he has shown ny of his examples what he can do if his means are properly ed.

srs. J. N. Richardson, Sons, and Owdin, of Belfast, showed some very r examples, but several were disfigured by these unmeaning irregu- in design. The bleached specimens were noticeable for their , which is remarkably glossy, and for the clearness of their colour. masks of Messrs. John Brown and Son, of Waringstown, Banbridge, ticeable, in many points, for the character of the design, as being onsistent with the artistic effects required by this material.

rs. Crawford and Lindsay, of Banbridge, and Messrs. Corry, Blain, ., may justly be reviewed at once, since it is quite evident that the roportion of the articles they exhibited are the same, or nearly so. oth exhibited by the former had some excellent points, the centre peculiarly effective in design, as, indeed, is the whole cloth, except wer-baskets at the corners. In the other examples by these two e weaving is very superior; the drawing of the objects with which e decorated is also very good, but then those objects are not the ate ones for textile decoration—vases and baskets being used for uping of fruits and flowers. Still it is only right to say, that they worse than their neighbours in this respect; we only regret that ne else does not do better.

whole, there was much to be satisfied with in the display of talent ustry made from the North of Ireland.

SCOTCH DAMASKS.

FERMLINE is, of course, the great representative of this department of cture as pursued in Scotland, and it worthily sustained its old ion, alike in the white as in coloured damasks.

David Birrell, Dunfermline and London, exhibited some admirable ns of table-linen. The borders were well designed, and the whole lly drawn and woven; but a mistake, in an attempt at a profile bust of her Majesty was the ruin of the whole in an artistic sense. What earthly use can it be to weave a portrait in the centre of a table-cloth, at the very point, too, where it is usual to place the largest dish or the great ornament of the table, apart from the consideration that such portrait can only pretend to be a mere shadow of a likeness. This mania for weaving the human form divine is a mistaken notion derived from the French, because they sometimes try their skill in triumphs of art, as producible by the loom as specialties, and commit the error of introducing the figure where it has no business to be introduced, our manufacturers seize upon the exception and proceed to make it the rule, because it seems something wonderful in their eyes to be able to do it.

Mr. William Kinnis exhibited excellent bleached samples of damasks, having none of these high pretensions, but good in design, because they are to the point. Mr. Kinnis also exhibited a beautiful specimen woven from China grass, spun by Messrs. Marshall, of Leeds. The silky texture and clear colour of this example were worthy of special notice.

Messrs. William Hunt and Son showed excellent examples, both of damask table-linen and table covers. The bold and effective character of one example of the former is unquestionable, and we should be glad to see similar patterns produced in the various styles of ornament, or in the reproduction of natural types, rather than those very strange-looking examples of arabesque decorations in which deer-stalking and castles form the prominent patterns. Buildings in linen are absurd, and woven in linen as decorations are certainly to be avoided by every one having any pretension to correct artistic taste. The cloth with the Etruscan centre is very good, except that the border does not agree in style. Why should it not do so, if the designer knew what he was about?

The display of Mr. Erskine Beveridge completed the contributions from Dunfermline. The vine pattern, exhibited by him, was especially noticeable for its true geometric and ornamental treatment. The napkin was quite a gem. There were two or three cloths of the classic school, very excellent as specimens of manufacture, and admirable, too, for the skill displayed in the drawing, and weaving, but, as already stated, figures and buildings are out of place in these fabrics. The bust portrait of Prince Albert in the centre of another example only served to deteriorate that which otherwise would have been one of the best examples of its class in the Exhibition.

In stating that Mr. Beveridge's display completed that of the Dunfermline contributors, we overlooked the fact that Messrs. Dewar and Sons, though a London firm, are also manufacturers at that place, and accordingly exhibited in that capacity as well as represented the London house. The examples were beyond all praise as specimens of weaving, and as efforts in design, they also deserve recognition: but the fact that they are injured by the introduction of figures, which, in reality, have no relation to the purpose of the article decorated, is an objection which we have so frequently urged, that it is scarcely worth while to refer to it again.

The examples exhibited by Mr. Charles Pegler, of Leeds, would appear to be both of Irish and Scotch manufacture, since in that described as manufactured for Mrs. Fox, of Bramham Park, we find the border exactly the same as the one exhibited by Messrs. Dewar with the stag in the centre. This contains the armorial bearings of the above lady, to individualise it. Again, the double damask made for the Rev. Charles Wheeler, has a centre similar to those exhibited by Messrs. Corey, Blain, and Co., and Messrs. Crawford and Lindsay. This, then, was a joint-stock vase and flowers, as it appeared to be the property of several. Altogether Mr. Pegler's display was a very good one. The cloth manufactured for the Earl of Harewood, as also that for the mess of the Royal Horse Guards, are highly creditable to his enterprise. The communion cloth (p. 297), beautifully as it is woven, is spoiled by the character of the ornamentation, or rather that which should have been ornamentation. Pictures are not properly emblems, but representations: the only emblems here of the Lord's Supper are the vine and the corn; these are very properly introduced, but the picture is wrong in principle, and absurd in practice, costing more to do than a thoroughly effective and properly drawn ornament would do, and yet giving no result.

FOREIGN LINENS.

WE now proceed to a brief notice of foreign linens; and it must be remembered that Flanders was the original seat of this trade in western Europe, and that the manufacture was brought to this country from the Flemish seat of manufacture and from Holland, the favourable climate of Ireland having been soon discovered as likely to be of more than ordinary importance to the manufacturer, who in the earliest times was at once the grower, preparer, spinner, and weaver of the raw material raised by himself. The revocation of the Edict of Nantes was, as in the case of the silk trade, one of the great causes of the successful establishment of the linen trade in great Britain and Ireland; and in the latter country, the Earl of Strafford had, prior to that event, brought some workmen from France and Flanders, and erected looms for the purpose of working up the raw materials raised from the superior seed he had previously imported.

The state of the manufacture in the countries whence we derived our trade in linens does not appear to be in so flourishing a condition as might have been expected, under the pressure of the great movement now going on in favour of manufactures; since, possessing all the facilities for raising the raw material and all the traditionary knowledge of its preparation, it might have been expected that more would have been done.

BELGIUM.

THE damasks exhibited by M. P. Verriest, of Courtrai, were of a coarse but effective character, such as would be used for every-day use. M. C.

Dujardin, also of Courtrai, exhibited napkins of very fair design, one being a specimen of that kind of weaving against which we have pronounced so strongly, since it represents, or is intended to represent, the King of the Belgians on horseback. M. T. Dommer, of Alost, exhibited specimens of excellent character in weaving and respectable design, the portions of ornament being good; but, as usual, the weaving of the human figure comes in to mar the excellence. This exhibitor showed some cambric handkerchiefs of good quality. M. B. Hausens-Hans, of Vilvoide, contributed examples of a similar character, to which the same remarks may be applied. The bleached examples were admirable.

ARCHITECTURAL MEDAL.—WIENER OF BRUGES.

There were one or two other exhibitors from Belgium who exhibited coarse and serviceable damasks and diapers of good character, the design being generally very fair.

AUSTRIA.

The Count Harrach, of Janowitze, Moravia, and Starkenback, Bohemia, exhibited very excellent examples of linen furnitures, the designs of which were generally appropriate, being woven in a variety of colours, but all of such a character as to suit the material. The adaptations to hangings and window-curtains were well managed, and our manufacturers may take a hint therefrom, which with taste and skill may become useful to them. The bleached examples of the small cloths and napkins were excellent, and the taste in design far above the average of this kind of goods. The printed examples, too, were novel and well executed.

The Benevolent Society of Milan exhibited bold and effectively designed coarse damasks, and there were some excellent linen ginghams exhibited by John Lang, of Vienna.

From Ullersdorf, near Schonberg, Moravia, there were presented some specimens of raited flax, whilst Russia largely exhibited the raw material, as well as hemp, and specimens of cloth of a coarse but varied quality manufactured therefrom.

ZOLLVEREIN.

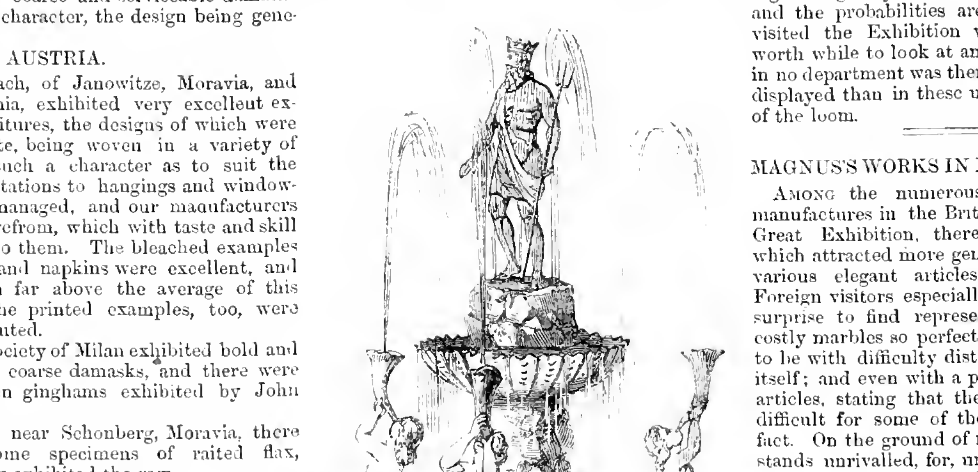
The states of the Zollverein displayed some admirable specimens of flax manufactured in various forms, the coloured specimens being of a novel and excellent character. M. Kauffman Schweidnitz, exhibited coloured damask for hangings exceedingly well designed, chiefly in stripes. Christian Dierig, Langenbielau, in Silesia, also exhibited Jacquard woven damasks in stripes, the patterns and colours of which are well selected; indeed, some of the designs are peculiarly elegant and appropriate and in great variety.

A. H. C. Westermann and Sons, Bielefield, exhibited a good assortment of bleached damasks and diapers of good character, the designs being occasionally very elaborate and elegant. The display of the larger examples shown by this house was a very effective one. The designs were generally broad, bold, and artistic, and when n[ot] tempted to get into the routine course in the introduction of animals, t[he] whole were in excellent taste. The Byzantine design was admirable, and the heraldic portions of one or two remarkably clear and effective.

Erben Anton Eichbolt, of Warendorf, Westphalia, showed small cloths, all of which were excellent specimens of weaving: the borders were admirably drawn and designed, and were perfect models for our designers of damasks. The centres of these cloths, however, were architectural representations of Cologne cathedral, and Scott's monument at Edinburgh. They were drawn and woven with wonderful precision, but had no business to be executed in such a fabric.

ORNAMENTAL SLATE TABLE.—MAGNU[S] AND CO.

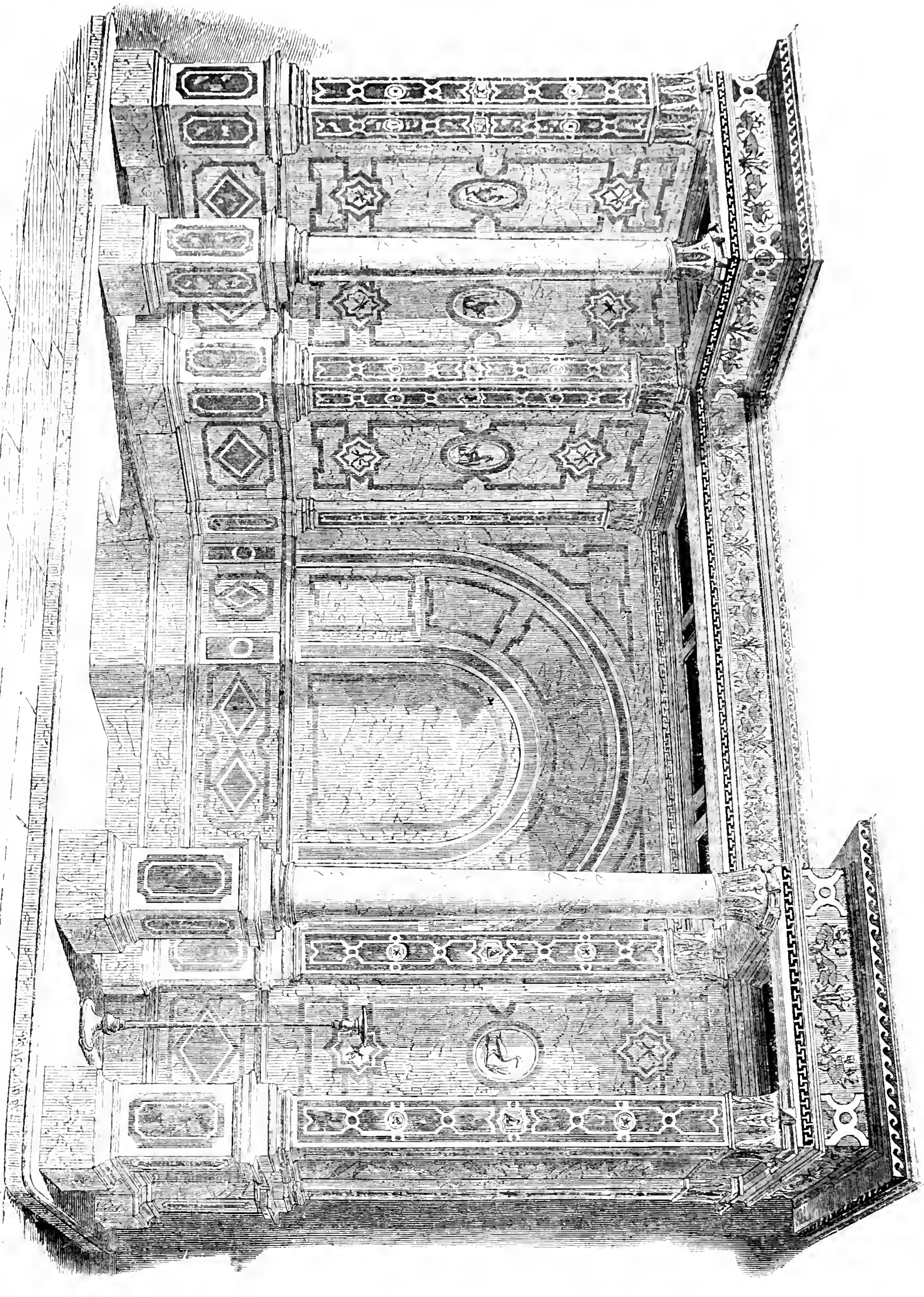
On the whole, the display of linen damasks was an interesting, though by no means an attractive o[ne], and the probabilities are, that thousands h[ave] visited the Exhibition who never though[t it] worth while to look at any of the examples, [yet] in no department was there more skill and ta[ste] displayed than in these unostentatious prod[ucts] of the loom.



BRONZE FOUNTAIN.—JABEZ JAMES.

MAGNUS'S WORKS IN ENAMELLED SLA[TE].

Among the numerous interesting min[eral] manufactures in the British department of [the] Great Exhibition, there were few, perh[aps] which attracted more general attention than [the] various elegant articles in enamelled s[late]. Foreign visitors especially appeared struck [with] surprise to find representations of their [most] costly marbles so perfectly faithful to natu[re as] to be with difficulty distinguished from ma[rble] itself; and even with a placard attached to [the] articles, stating that they were of slate, it [was] difficult for some of the visitors to believe [the] fact. On the ground of novelty enamelled [slate] stands unrivalled, for, until the last few y[ears], the uses of slate were limited t[o the] roughest purposes. An occas[ional] piece had indeed been smoo[thed], painted, and varnished in the [form] of tea-trays, and ornamented w[ith a] flower or bird in the Birming[ham] fashion; but it remained for [Mr.] Magnus to display its full cap[abilities] and to adapt it to its pr[esent] varied purposes, [su]perseding in a [great] measure the u[se of] foreign marbles, [and] thus opening [a] wide field of [em]ployment for n[ative] artists. Amon[g the] articles disp[layed] were a portion [of a] bath-room, in w[hich] representations [of] porphyry, lapi[s la]zuli, giallo an[tico], and other ma[rbles] and rare stones [were] introduced wi[th a] pleasing and ar[tistic] effect. A col[umn] and vase of [por]phyry—a sple[ndid] billiard-table, [the] legs and fram[e of] which, as wel[l as] the bed, are [of] slate; several [in]laid table-tops, chimney-pieces, candelabra, &c.—served to show the m[any] purposes to which this useful, novel, and interesting inventio[n is] applicable.



MUSICAL INSTRUMENTS.

FLUTES, VIOLINS, &c.

IT has often been a question—and one which would be most interesting to solve satisfactorily—whether the flute, so popular among the Greeks and Romans and other nations of antiquity, was the same in form as the German or transverse flute of the present day: there are no correct data on which to form a direct answer to the question. We have no instruments of the kind handed down to us, nor any sculptured representation answering to the description, for the musical instruments, as well as the music of the ancients, are enveloped in almost impenetrable mystery. It is true, that, on some Roman tesselated pavement, there was discovered the representation of a young man playing on an instrument similar to the flute, held transversely to the mouth; and, we have heard, there is an antique statue of a fawn, with a pipe, in the same position; but we have no means of proving this was the flute of the ancient Greeks. When the flute is spoken of by the Greek and Latin authors, it is evident not a single instrument, but a class of instruments is alluded to. If we were, however, to hazard an opinion on the subject, we should be inclined to hold with those who believe that the flute of the ancients was open at both ends, and held perpendicularly when played. We are strengthened in this opinion by the fact of there being right and left-handed flutes, and that they differed in tone, and were employed under various circumstance, according to the character of the music, whether solemn or lively, grave or gay. The right-handed flutes gave the bass, and the left-handed the treble notes: they were often played alternately, and it will at once be perceived, that while it would be perfectly possible to play right and left-handed flutes held perpendicularly, and to change them with facility, it would be exceedingly awkward and difficult to do the same thing with the instrument held transversely. How far this inference helps to decide the question, we must leave to be determined by others; but that the flute was held in the highest estimation by the Greeks and Romans, and that it was their most important musical instrument, there can be no doubt. Prizes were contended for by the most celebrated performers at the Olympian and other games; the professors and teachers of the instrument realised handsome fortunes, and lived in a style of the greatest luxury and extravagance. There were also colleges of flute-players, and bands of fifty and 100 performers. Among the Grecian and Roman ladies there were also several celebrated players, and, like the pianoforte at the present day, it was considered an indispensable accomplishment among the highly educated and fashionable. It was also the principal musical instrument employed in the sacred services of the temples. Even Xenophon thought it not unworthy of him to give his advice to professors; and to a young man who did not meet with the patronage he desired, he recommends "to take a large house and live in great style, that he may be *thought* a first-rate performer." This advice, how to make a reputation, is often enough acted upon in the present day, much to the hurt of the really clever and honest professor; and this branch, at least, of the art, or rather arts, of the musician seems to have undergone little change since the historian of Cyrus.

We must now turn to the flutes in the Great Exhibition; but first we will give a glance at the improvements introduced by Böhm of Munich.

M. Böhm produced his first flute in 1832; but it was brought into general notice by the Academy of Sciences at Paris, who, on its being brought before them, with the ready attention to scientific improvement which characterises that distinguished body, at once named a commission to inquire into its merits, whose report was unanimously in its favour, and who at once recommended its adoption in the Conservatoire of Paris in preference to the old flute. Had it not been for this favourable report, and the alacrity with which every improvement in art or science is taken up on the Continent, we are afraid the flute of Böhm would have been long ere it found its way into general use, and would have had an overwhelming amount of prejudice to contend against, prejudice of the worst kind, namely, that founded in ignorance.

The improvements in Böhm's first flute consisted in the correct distribution of the holes at equal relative distances, and in making them of equal sizes. This was effected by following out the principle on which a single note is produced, and applying it to the production of others. Our readers will at once understand this, by considering that any tube of a certain given length and diameter will, when sounded, give out a certain note of a certain pitch. Assume that note to be C natural, by cutting off a proportionate quantity of the tube the tone is sharpened, and C sharp can be produced; by again cutting off the same quantity, you get the next note higher, and so on until the octave is completed. Instead, however, of shortening the tube in the flute, and other instrument of the kind, holes are bored at the same distances that the tube would be shortened, which answers the same purpose. Now, supposing the diameter of the tube to be the same throughout, an equal quantity ought to be cut off to produce each note, therefore the holes answering the same purpose ought to be equidistant. We may observe that there may be some slight modification of these principles to answer particular purposes, such as the equal temperament in tuning, &c.

The other improvement in Böhm's first flute is the substitution of open for closed keys, he having discovered that not only was it mechanically easier to keep a key open with a spring which was not required to be strong to keep it open as to keep it perfectly closed, but also that the clos keys acted as a damper to the next note above, and produced a muffl tone, or what is technically termed a veiled note. This was Böhm's fi flute, and how it was appreciated on the Continent we have already show He next found, that, however exactly he placed the holes, some of the no were still unequal—some being weaker, and not so clear and full as t others. It then occurred to him, that there must be something radica incorrect in the primary construction of the tube; he therefore substitut a perfectly cylindrical in the place of the conical bore, and introduced l parabola head joint, which has the effect of refracting and propelling t sound with greater velocity, and, though not necessary to the producti of perfect and equal notes (the correct proportions of the cylinder and t placing the hole effecting this), is of great advantage as an aid to quicl and more facile execution. It was evident that in the conical bore t notes in the narrow part of the tube could not be so clear and powerful in the wide, and that, by adopting a perfect cylinder, there would be t same force to every note, and they would consequently be equal.

This was the second improvement of Böhm, and we see that he h entirely to remodel the construction of the instrument. The sa principles apply also to other wind instruments.

Seeing how self-evident and simple are the principles upon which th effective improvements have been founded, the wonder is that they w not adopted before; but it must be borne in mind, that the transiti from the old flute, A, B, C, to the German flute, and thence to the pres keyed flute, was not effected at once: note by note, and key by key, v added to suit the necessities of the performer, or the idea of improvem possessed by the manufacturer. An improved but imperfect instrum had grown up, and while, from time to time, considerable talent a ingenuity was employed in perfecting it, the makers and professors w hardly prepared for an alteration in the very first principles of t construction of the instrument.

M. Böhm, in the Foreign Department, Bavaria (No. 23), exhibited cylindrical flute, of silver with the following improvements—corr proportions in the construction of the tube, a new arrangement of t key-mechanism, and a new form of embouchure of gold; *flute d'amour*, B flat, in German silver; and a model of a patent hautboy, constructed the same principles. These three instruments were not so remarkable their high finish in point of workmanship, though in this particular tl are excellent, as for the disposition of the keys, which are arranged to co under the fingers in a more natural and regular order. At first sight, mechanism appears somewhat complicated, and we have heard this brou forward as an argument against Böhm's improved arrangement of the ke We cannot, however, but consider it an ill-founded prejudice. Any pi of mechanism that has more than a single simple motion, according this rule, would be complicated; we might with equal reason call the la marine engine, of Bolton and Watt, complicated, as compared with primitive model of the early application of steam-power to locomoti When every piece of mechanism has its proper employment and use, a does not interfere with the action of the other, there can be no complicati The first repetition action applied to the grand pianoforte was cal complicated; yet we now see that no instrument of the kind is conside complete without.

We now turn to the French department:

M. Clair Godfroy, Sen., of Paris, exhibited wood and silver flutes of f workmanship and high finish in every particular.

M. Tulon exhibited improved flutes, with a new disposition of the ke and hautboy, of first-class construction and make.

M. Bouffet, Jun. exhibited clarionets on a new plan, flutes, oboes, a bassoons, for military bands, of excellent construction.

M. Tribert exhibited flutes and clarionets, highly finished, and a clario in tortoiseshell and silver. M. Breton, crystal and wooden flutes, Böhm's principle, and clarionet, also on Böhm's principle, of very excelle make, but we cannot see the beauty or utility of the crystal flutes. T other exhibitors in this department are M. Besson, and M. Roth.

In the Austrian department, M. Uhlmann, of Vienna, exhibited hautbo and clarionets elegantly mounted and of fine workmanship. In the Belgi department, M. Mahillon, of Brussels, exhibited clarionets, &c. Fr Denmark, M. Silboe, of Copenhagen, exhibited an ebony flute, with elev silver keys, and an archimedean bore; clarionet, in B flat, with t mouth-pieces, on J. Van Müller's construction, and also hautboy, on t older Dresden pattern.

We had also flutes and other wind instruments of wood from t Zollverein, Saxony, and other parts of Germany; and in the Americ department, M. Eisenbraut, of New York, exhibited some highly finish flutes, with jewelled keys. In the English department, Messrs. Rudall a Rose, exhibited Böhm's patent flute, Carte's patent flutes in silver and woo and the improved ordinary flute: all of the highest possible finish. Befo the improvements of Böhm, Messrs. Rudall and Rose had arrived at t greatest attainable perfection in the manufacture of their flutes on t old system, not having the good fortune to light on the same improveme as Böhm: they, however, knew how to appreciate them, and at once ma arrangements with him which secured to them the sole right manufacturing flutes on his principle in England.

Before leaving the subject of flutes, let us suggest to the manufacture and professors of the instrument the propriety and necessity of combini together, and deciding on the adoption of one perfect system of fingeri

sposition of the keys. At present there are no less than six or seven s; and great as have been the improvements on the instrument, and ful as it may be in tone and perfect in intonation, it can never become popular or do otherwise than decline, as undoubtedly it has, so long defect exists, and the learner, who imagines he has acquired the art -playing, finds to his mortification, that he has only learnt the system, s erroneous, of a particular master or manufacturer. Who would on this is the case, abandon the instrument in disgust!

limits would not allow us to enter into the history of the violin, and o its progressive improvement would be a difficult matter. The unlike all other musical instruments, has remained stationary, and dergone little or no improvement since the days of the Amatis, , Guarnarius, and Straduarius; and in the hands of these inimitable s the instrument seems to have reached its greatest perfection. ng, again, from other musical instruments, the violin improves by age, nce the instruments by the old masters fetch immense prices, and by Amati and Straduarius have realised as much as from 200 to 300 s for a perfect instrument in fine preservation, and 70*l.* to 80*l.*, or would be considered cheap for a good Amati. Straduarius, at the moment, is in much request, and fetches the highest price.

mencing with the violins exhibited in the French department by ne of Paris, we find the style and workmanship of the famous Italian of Cremona—Amati, Straduarius, Joseph Guarnarius, imitated with ing truthfulness and beauty, and the appearance of age and wear with remarkable exactness. Those who are aware that the knife is the principal tools employed in the construction of the violin, and ence the cut and form of the scroll and sound-holes peculiar to each is almost as well known and distinguishable as the style of a person's riting, will appreciate the cleverness and beauty of these imitations. rnish of these instruments, however, seemed deficient in richness and ey. M. Villaume, also, exhibited a violoncello and bass of excellent and a gigantic double bass with machine head and stops; also bows y machinery, patented.

onnardel, M. Jacquot, and MM. Husson and Buthoæ, were amongst er exhibitors.

e Austrian department we found also some beautiful models. nrico, of Cremona, exhibited a violin of great elegance and beauty, able also for the brilliancy of its varnish.

ittner, of Vienna, exhibited violins, tenor and violoncello, exceedingly nd worthy of notice.

osselt, of Turnan, Bohemia, violoncello, inlaid with mother-o'-pearl; Herzlieb, of Grätz, Styria, violins, tenor and violoncello, of first-rate anship. We had also in this department some fine specimens of strings, from Padua and Venice. There were also a considerable r of violins, tenor violoncellos, and double basses, exhibited in their nt departments, from various parts of Germany; but, however good ight be in tone, they displayed neither the elegance of form nor finish violins on the Italian model. There was also a small violin in the n department, the upper part made of fir, the sides, the back, &c., of wood, by H. Ruderd, of Warsaw; like everything else in this nent, it was of excellent workmanship. In the English department, Purday and Feudt exhibited violins, violoncellos, and a double bass, ch, without servilely copying the old Cremona makers, they had cled in producing very beautiful models. In these instruments they ot attempted any artificial seasoning or colouring of the wood by it, and saturating it in lime, to cause effects which only age should ut have produced new instruments on as perfect a model as possible, h the wood is in no way weakened or impaired, but left in its state and appearance. This was the method of the old Cremona s; had they done otherwise, their instruments would never have ed their freshness and strength, matured by age, for a period of ls of two hundred years. Messrs. Purday and Findt have also ed a varnish which they think, with time, will equal in brilliancy rability the celebrated varnish used by the old Italian makers, the ation and application of which is a secret supposed to be lost. It to answer very well, but we think climate has much to do with it, at no varnish will dry so well in the damp atmosphere of this country, at the excellence of the old varnish is in a great measure attributable warm dry climate of southern Italy, which no artificial heat ual; the same causes are in operation in America at the present it. The cabinet-makers of New York employ a copal varnish for rniture, pianofortes, &c., greatly surpassing in brilliancy and dura- our French polish, but which the moist atmosphere of our own makes it impossible to apply in the same perfection as in their dry re air.

rs. Betts exhibited two violins, correctly modelled and finished with are. Mr. Foster exhibited a violin and violoncello made after the of his grandfather, well known as "Old Foster," whose instruments l much esteemed for their clean workmanship and excellent tone.

FOUNTAIN.—BY JABEZ JAMES.

ttle fountain, studded with dolphins and sea-monsters, and crowned figure of old Neptune himself, is cast in bronze, and is supplied with y a small engine. It is well adapted for the decoration of a summer- or a cottage verandah. (See p. 300.)

HARDWARE.

SHEFFIELD MANUFACTURES.

THE conversion of iron into steel, (to the extent of many thousand tons annually,) is the principal manufacture of Sheffield; and the several processes of cementation, blistering, shearing, casting, tilting and tempering, were illustrated by specimens in the Exhibition. Thus, Messrs. Johnson Cammell, and Co. of the Cyclops Works, exhibited progressive specimens from the imported iron up to the most refined state of the metal in the varieties of "cemented blister," "double refined cast," "double shear," or "elastic spring." Their display of tools included their "curvilinear tanged file;" and their "continuous tooth concave and convex file," the latter rewarded by a medal from the Society of Arts. The careful finish of their work was also shown in their springs for railway carriages; and in a piston-rod, weighing 16 cwt., the finest and largest piece of steel in the Exhibition. Another assortment, forwarded by Turton and Son, illustrated steel-manufacture from Swedish bar-iron. The same firm contributed a steel ingot, weighing upwards of 1 ton 4 cwt., intended for one of a pair of piston-rods for a marine engine. It consists of the contents of 48 crucibles, each charged twice with 80lb. weight of steel; the operation was performed by 40 workpeople, and the pouring of the melted liquid steel into the mould was accomplished by three men in eight minutes.

From the various kinds of steel are manufactured cutlery, needles, hooks, ornaments, &c.—a class of production, which has made this seat of industry famous since the days of Chaucer's "Sheffield Thwittle." Among the tools exhibited was a cast-steel circular saw, 5 feet in diameter, by Spear and Jackson. Messrs. Unwin and Rogers's display of spring-knives, pistol-knives, and surgical instruments, was good: a case contained the preparations of steel wire, in the process of manufacturing needles. The Etna works displayed circular saws, files, hammers, adzes, &c. An assortment of files and rasps, from 1 to 46 inches in length; and a case of scissors and shears of every variety, highly ornamented, with specimens arranged, from the rough steel to the finished article, were exhibited by Hunter. Messrs. Turner and Co. displayed a pair of Albert venison-carvers, with stag antlers; and the Prince of Wales's sailor's knife. We must not, however, omit to record a brilliant trophy of Sheffield cutlery, arranged in a case in the western nave of the building. It contained 230 pairs of scissors of every size and pattern, grouped and mounted upon a white ground; the centre object was a pair of huge scissors, 22 inches long, the bows and shank representing in outline two crowns; the upper one surmounted by a thistle; all the ornamental work is wrought with the file, some portions of the surface being chased. This object is by far the most expensive pair of scissors ever produced in Sheffield. On each side of this appeared another pair, nearly the same size, and scarcely less beautiful or costly. One pair represents, in chasing, the bruising of the serpent's head; in the centre is wrought out with the file the Prince of Wales's feathers: and the bow is the shamrock, rose, and thistle, and scrollwork—all wrought out with the file.

Next was illustrated the scissors' manufacture, in its ten stages. Among the most striking specimens was a pair of 16-inch fancy nail-scissors, ornamented with etching; a group of surgeon's scissors, curved, angular, and distorted for difficult operations: a sportsman's knife, containing 80 blades and other instruments; also, one $\frac{3}{4}$ of an inch long, with 51 blades and other instruments; and a case containing 12 perfect pairs of scissors, yet so small that they do not weigh half a grain.

Another striking feature was the variety of stoves; register and air, cooking and gas, heat-reflecting, smoke-curing, &c.

Among the gas-burners exhibited was the self-regulating apparatus, by Mr. Biddell, who introduces into the centre of the burner a vertical compound rod of about $\frac{1}{4}$ inch diameter, the cylindrical case being of brass, and the core within of steel. By the expansion and contraction of this rod, which is surrounded by the flame, a small lever and simple valve, in connection with the bottom of the rod, are acted upon so delicately, that the exact amount of gas required to preserve uniformity of flame is preserved.

One exhibitor, who has great faith in a new name, sent a saucepan with a false bottom, upon which, potatoes being placed, covered up, and set upon the fire, steam is generated, and thus the potatoes are cooked in the water they contain—a contrivance called the *Anhydrohepseterion.*

Dr. Arnott's stoves, and ventilating apparatus, were exhibited: with Peirce's pyro-pneumatic stove, made of fire-clay in pieces, through which are air-keys, the whole cased with iron; an open fire warms the fire-bricks, the passages between which are connected with a pipe leading to the external air, when the warmed air rises into the apartments, and a supply of fresh air is obtained from without.

Edwards's Patent Atmopyre was shown: it consists of a porcelain chamber: within it is the gas-fire, which escapes through minute perforations: the mass thus becomes red hot, or, in the words of the patentee, "solid gas fire" cooking stove. Several gas-meters were also shown here.

The stove-grates tastefully displayed painted china and ormolu, encaustic tiles, gold medallions and scrollwork, marble and alabaster; and we learn from Mr. Hunt's excellent *Hand-book*, that 7 of these grates and 6 fenders have been designed by pupils of the Government School. The fire-irons and fenders were also of corresponding elegance.

There were several specimens of patent wire ropes exhibited by Messrs. Newall; and of flat chains with wooden keys, for collieries, by Mr. Edge. Messrs. Henn and Bradley supplied a good assortment of their crown-tapered screws, of the most delicate structure for pianofortes, as well as for the heaviest railway purposes.

Among the Foreign cutlery, the Prussian and Belgian specimens approached nearest the excellence of English manufacture, of which many were evidently imitative in style.

SHEFFIELD PLATING.

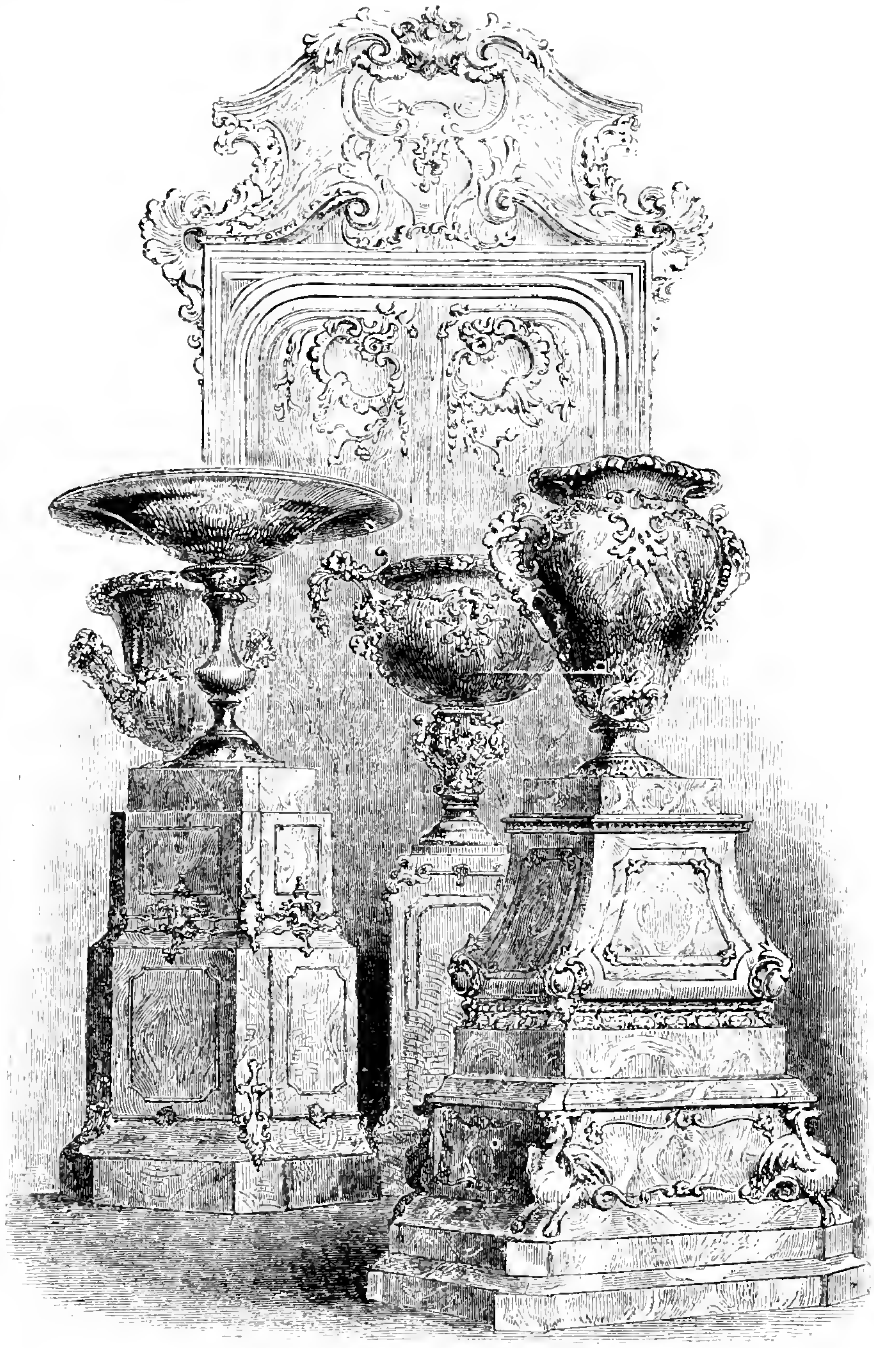
ALTHOUGH the electro-plating process is extensively applied, Mr. J. G. A Creswick, of Sheffield, states, in a letter to the *Times*, that the old and substantial method of plating on the ingot by fire still obtains in that town, and is almost entirely used in articles for the London trade—such as dishes and covers, tea-sets, candelabra, &c; and in many cases such goods (made by the first class of Sheffield manufacturers) have stood the wear of from twenty to thirty years' use.

Mr. John Gray, of Billiter-square, exhibited a series of articles illustrative of this method of plating, commencing from the ingot and terminating in the finished article. The ingot is composed of copper alloyed with other metal, so as to impart to it the necessary roughness and rigidity. The plate of silver is tied upon its polished surface with wire, and the combined metals are then heated in a furnace, till both bodies are in a molten state, and thus become most effectually united. After this process, the two metals united form an ingot which is subjected to rolling and hammering into form; which test the electro-process never subjects articles to, as they are all coated after the goods are finished so far as manipulation and annealing is concerned. Soldering the silver upon any baser metal is only practised in making cutlery, and does not at all apply to plated manufacture, being a distinct branch of business.

Mr. Gray also exhibited an ingot of copper previous to this process, with the plate of silver tied up on it with wire; ingots of copper and white metal after the silver plate has been united to them by an elevation of temperature only; and a sheet of plated metal, rolled from a plated ingot. A table dish, made from the rolled metal, was the next in the series, with the silver mountings laid upon it, but not yet soldered. The steel dyes in which the silver mountings are struck, together with the mountings produced by them, were also shown; in fine, the table dish was exhibited in its finished state, as well as a specimen of a salver produced by this manufacturer.

The metal now used at Sheffied as a foundation for plating, is German silver to a very great extent, (whereas, formerly copper was used,) and is thus, on a white foundation, little inferior in colour to the silver which forms the outer coating or surface.

Plating by fire is the mode that has been practised in Sheffield for more than a century, and is still styled in the London shops "best Sheffield plate," in contradistinction to other spurious and inferior productions.



MALACHITE DOORS AND VASES IN THE RUSSIAN DEPARTMENT.

METALLIC PENS.

A STEEL pen is as great a wonder of the present day as a pin was tc ancestors. Large black and red pens were made of steel early in the pr century; but the extensive introduction of steel pens dates from 1828, Mr. Gillott, of Birmingham, patented a machine for making them 1830, when Mr. Per London, added to flexibility 'by aper between the shoulde the point.' About years 1820 and 182 first gross of thre pens was sold who at 7*l.* 4*s.* the gross cheapest pens are sold at *twopence* the and the price rises the elasticity and of the pen up to 3 and 5*s.* per gross. N 150 tons of steel are to be now annually into pens; and, in Birmingham esta ment, 500 hands are employed. Here outline of the s stages of the ma ture. The rolled steel being received Sheffield, is cut into put into cast-iron and softened by hea rolled between cylinders to the re thickness. The st then passed to a w who, with a hand cuts out at a single the future pen; good hand will cut per day of ten The central hole an slits are cut by a press; the semi-pe then softened by by a die worked l foot, are stamped the maker's name then by a machine p into a cylindrical The pens are again h and then thrown oil, which makes very brittle; but are cleansed and re to elasticity by p them in a tin cyl turned over a fire, coffee-roaster; the are next scoured wit dust, in cans place frame which revolv steam. Each pen i ground at the bac two ways, at right to each other, or over each other; th holding the pen wit pers for a moment revolving "bob." pens are then slit tool very nicely into a hand-press, t by a handle. They are then examined and sorted; and lastly, varn with lac, dissolved in naphtha, evaporated by heat.

Messrs. Gillott's specimens ranged from a monster pen, weighing and measuring 1 yard in length, to a Lilliputian weighing 4 grains monster containing metal enough to make 1,092,397 of the tiny ones colouring of the metal is very rich. In a glass case, too, the whole h of the manufacture was wonderfully told. In an adjoining case, by and Co., were shown silver and gold pens, some tipped with iridiu osmium, the hardest of known metals; and in Hinckes and Co.'s ca a series of nut-shells, each containing an incredible number of infinit pens of great finish, which it required a microscope properly to appr Messrs. Perry also exhibited some fine specimens.

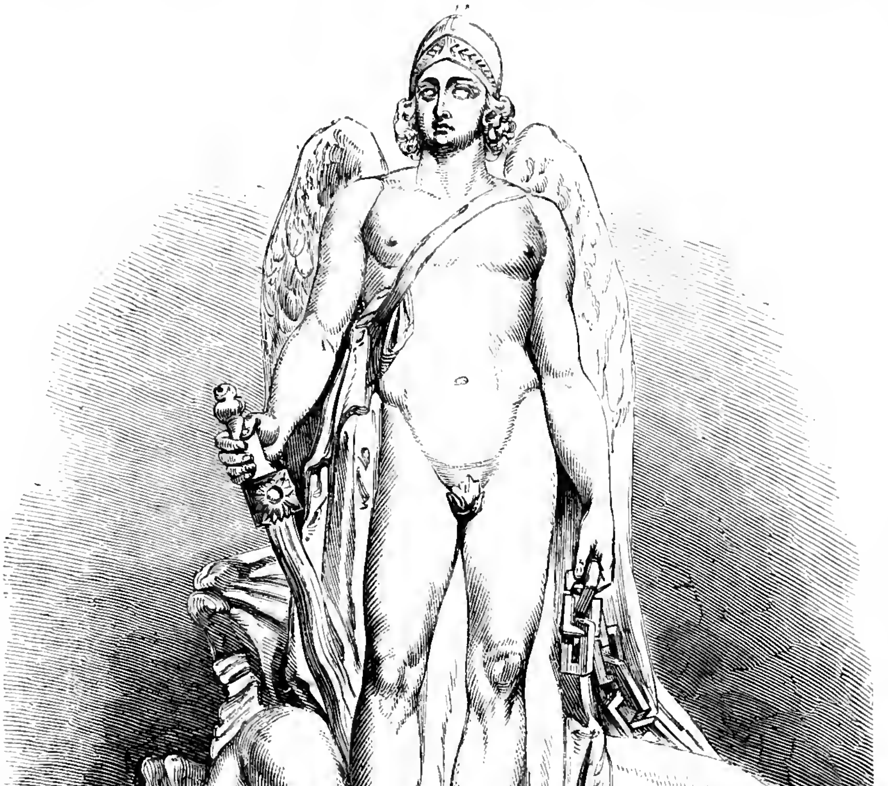
The CRYSTAL PALACE AND ITS CONTENTS

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

ARTS OF DESIGN AND DECORATION.

SCULPTURE.

[W]E resume our notices of the Sculpture in the Great Exhibition. We begin with Power's Greek Slave (see p. 320), which was thrust [fo]rward in such a prominent position, and upon which king Mob lavished much wild and un[m]eaning encomium. We [m]ust state boldly, that we [d]o not join in the admira[ti]on bestowed upon this [w]ork, and as we are aware [th]at in so doing we run [co]unter to opinions of the [m]ajority of the critics of [th]e day, we may be per[m]itted to make a few [m]ore observations to ex[pl]ain, perhaps to justify, [ou]r position. First, the [fi]gure is ill studied: of [co]urse, the proportions of [b]eauty are, to a great ex[te]nt, matter of taste or [o]pinion; but without [la]ying claim to infallibi[li]ty in these matters, we [av]er that the figure of [th]e Greek Slave, as it [is] wide from the ideal [b]eauty of the antique, [w]ould, upon an average [of] suffrages, fail to esta[bl]ish its claims with the [pr]esent generation of be[ho]lder. It is a lengthy [le]ggy figure below; square [an]d high shouldered in [th]e upper part: the flesh [ha]s none of the plump[ne]ss and softness, the [at]tainment of which is [th]e triumph of the sculp[to]r's art; the arms, par[ti]cularly the left one, un[du]ly spare. Secondly, the [at]titude is constrained [an]d inelegant. The figure [is] made to lean with the [ri]ght hand against a post, [ju]st a very little too low [to] allow her to remain in [a]n upright position: the [co]nsequence is, that there [is] a departure from the [or]dinary repose of nature, [w]ithout a sufficient ob[je]ct, and an awkward out[li]ne on both sides of the [fi]gure, but particularly [o]n the left. It must not [es]cape remark, either, [th]at, in carrying out this [ill]-judged conceit of attitudinising, the artist, whilst he has shown its [ef]fects very prominently in the lower parts of the back, has overlooked it [en]tirely in the right arm and shoulder. The attitude is constrained and [in]elegant, because it wants naturalness—because it wants unity of purpose: [th]e arms drawn one way, the head turned abruptly to the other; so that [th]ere is no seeing the full face but with a side view of the figure, and that side, as a point of view, subject to many objections, and *vice versâ*. For the head itself, we cannot consider it by any means beautiful; to us it is certainly not pleasing: it is too square; the forehead too prominent for female beauty; the eyes too much sunk for any expression—and, of all shades of expression, that of softness, which is the attribute of womankind (in marble); and the profile, as it is the first view generally taken of this head, is unfortunately its least agreeable aspect: the nose sharply pointing outwards and upwards, instead of pursuing the direct line from the forehead, so as to preserve the oval form; the chin prominent and lengthy from the starting-point at the neck; and, to make the matter worse, and to complete the extravagance of the outline, the hair drawn up in a stiff hard knot, when a few loose loops falling half way down the neck would have done much to relieve the harshness of the general expression. The artist has bestowed much pains upon the little Greek cap, which with her other raiment, the unhappy slave has very neatly displayed upon the post against which she leans; but we think she would be puzzled to wear such a head-gear with her present mode of *coiffure*.



ARCHANGEL MICHAEL AFTER SUBDUING SATAN.—STEPHENS.

And now a few words about the incident supposed to be characterised in this production. Not to run the risk of doing injustice, we will copy the official description affixed to the statue:—"The figure is that of a young and beautiful Greek girl, deprived of her clothes and exposed for sale to some wealthy Eastern barbarian, before whom she is supposed to stand with an expression of scornful dejection, mingled with shame and disgust." A very interesting case, truly, but one the knowledge of which deprives the work of that legitimate charm "which attaches to the nude figures of ancient art, wherein an obvious innocent unconsciousness of *dishabille* prevents all compunctions on the score of propriety." The official account is particular to inform us of the accurate identity of the Greek costume, and the little cross; but adds, "the chains on the wrists are not historical, but have been added as necessary accessories." Necessary to go beyond the truth to realise the whole of a very painful conception, which, we submit, in its most offensive incident—that of the denudation itself—is not "historical!"

To conclude, the Greek Slave is a poor *rifacciamento*, with alteration, but without improvement, of the "Venus di Medicis," with a romance attached to give it a relish. It is a bad beginning for American art, on all accounts; which must produce something more *genuine*, if it intends to take rank with the schools, bygone and to come, of Europe.

In the British Sculpture Room stood a "Nymph Startled," in marble, by Behnes, which exhibits none of the meretricious coyness and other objectionable characteristics of the work we have just noticed at such length. The figure is cast in a good wholesome mould; the attitude graceful and animated, without affectation; the flesh soft and smooth; and the general finish of the work in every respect satisfactory. We must

THE STARTLED NYMPH.—BEHNES.

also admire, for the purity of its treatment, a whole-length marble figure, lightly draped, after the antique fashion, by T. Campbell, entitled "Portrait of a Lady as a Muse." These two were by far the best things of the kind in the room. Sharp's "Boy and Lizard" is a pretty conceit prettily carried out. The sitting statue of Flaxman, by the late M. L. Marshall, is a fine specimen of portrait sculpture, replete with dignified ease and high intelligence.

And while upon the productions of British art, there are several, which, though located in the Italian department of the Exhibition, we may properly claim, being the work of English hands. Of these, the two Nymphs, by the late lamented Richard Wyatt, justly claim pre-eminence, not only here, but perhaps above all other works of the same class in the Exhibition. Supposing the reader to have observed these works, we would say:—Remark in both the symmetry of proportions, the exquisite softness of the flesh surfaces, the winning simplicity of the attitudes, the smiling beauty of the faces, more particularly as regards the full round speaking eye of the smaller one; the classic proportions of the heads, set off and adorned with tresses light, wavy, and picturesque in form and disposition;—examine the careful finish of the whole, and you cannot hesitate to set these down as works evidencing the highest genius, and the nearest approach to artistic perfection. Close beside these was more lately introduced a figure entitled "Highland Mary," by B. E. Spence, a work not without merit, but tame and without speech, as compared with her two lovely neighbours. This figure is fully, indeed, somewhat heavily, draped, a great plaid shawl hanging down her back, and nearly touching the ground.

Mr. E. B. Stephens' group of "Satan Vanquished by St. Michael" (see p. 305), which stood on the left in the South Transept, is a composition not without merit, though it certainly does not attain that high poetic character which we look for in works of this class. The subject is severely treated the Archangel stands erect, without any attempt at attitudinising, whilst the enemy of man, whom he has just overthrown, crouches in the dust beneath his feet. There is a total absence of human passion in the expression of the face; a point in strict accordance, perhaps, with the heavenly nature of the personage represented, but which, on the other hand, would impose upon the artist the necessity of realising the supernatural dignity attaching to him—a task in which he has not been successful. A word with regard to accessorial details. It is certainly recorded that the Archangel brought down a chain from heaven to bind the serpent; and in a work of sculpture commemorative of the event, some reference might properly be made to it as being by no means unimportant; but, at the same time, we could have wished that the said chain had not been made quite so much of, and in such hard angular outline as Mr. Stephens has employed; that it had been at most faintly indicated as encompassing the prostrate evil spirit and not held up in triumph, in the hand of the Archangel. All such efforts at perfectionising petty details are unworthy of art, and betray a want of confidence in its higher resources.

In the Roman department, we found many efforts, in various styles and o various degrees of merit. An "Iconic Statue," by M. Lawrence Macdonald is a heavy, cold unintellectual study, upon which more labour has been bestowed than the subject was worth. A "Ceres," by John Gott, is of th commonplace order of prettiness. "Love Triumphant," by Angel Bienaimé, is a foolish conceit, consisting of a Cupid on a lion's back Benzoni's group of "Psyche trying to keep Cupid from carrying the gift o beauty to Venus," is a cold and artificial affair, considerable pains having been bestowed upon the heads. Rinaldi has a large theatrical lookin group of "Rinaldo and Armida," in which the female figure, arrrayed in Turkish costume, is finished with considerable roundness and softness whilst the knight is stiff as buckram, in coat of mail; the buckler, leggings and helmet being brought to a degree of polish which speaks highly of labou misapplied. Cardwell's group of two little boys with a bird's-nest, bus feeding their feathered captives, is one of many puerile productions both in the Roman and Tuscan departments, which are attributabl perhaps more justly, to a low standard on the part of the patrons of a than of art itself. In the front of the Tuscan chamber was a very vigorou and characteristic bust of "Lorenzo the Magnificent," by Costole, of Florenc Sad falling off in matters of art since his day!

Of the art of many-climed Austria we have spoken at some length in former Number; the bold and startling productions from the Zollverei (Kiss's "Amazon," the "Bavarian Lion," &c., to wit) we have also suff ciently illustrated from time to time. We may remark generally of th Zollverein states, with Prussia at their head, that in art they exhibited th crudeness almost inseparable from new efforts, when there are no ol examples, no traditional principles to guide the hand. The subject chosen are too often of a base order, unworthy of high art, and are some times treated with an extravagance intolerable to an educated taste. I may be sufficient to point to one very glaring example of both these errors Fortunately, it was not a very prominent one in the late Exhibition though, in Berlin, where the original of the work exists in marble, it i vastly popular—indeed, has received the highest honours. In an obscur passage in the rear of the Zollverein department was to be found, by thos who were curious to search for it, a cast of a Bacchante on a Panther, afte the original in marble, by T. Kalide, "sculptor and professor of arts." Nothing can be conceived in worse taste, or executed in more bold defiance of the proprieties. The Bacchante, a coarse, heavy figure, is dead—that i —is intoxicated, and lies sprawling on her back on the top of the panther who licks up the dregs of liquor she has left in her cup. The artist seem to have taxed his ingenuity to make the most of the most offensive features of such a subject, and we think he has succeeded.

In the French department, at the entrance of the Gobelins Room, stood a somewhat similar subject, though certainly not so flagrantly carried out by Glesinger. Here the Bacchante, having evidently indulged too freely in her favourite juice, is lying asleep in an attitude of wild *insouciance*, not upon the back of a panther, but upon a bed of vine leaves and grapes. The treatment is less indelicate than that of M. Kalide's figure, and the execution masterly in many respects; but still it is of a sensuous character which neither derives interest from the medium through which it is presented, nor adds dignity to the art employed upon it.

Still in France, we were struck with some very wonderful melo-dramatic scenes in plaster, by Lechesne, which attracted a crowd of gazers in the middle of the Nave: in the centre we had a woman fast asleep under some straggling branches of trees, whilst an eagle, with tremendous breadth of wing, was pouncing upon her naked infant, who blubbers piteously, but hopelessly. On either side were two exemplifications of canine fidelity and sagacity. In the one we saw a tremendous snake about to dart upon a little urchin, who, terrified, crouches behind a large dog of doubtful breed;

n the other group we saw that the young gentleman's confidence had not been misplaced, for there lies the venomous reptile, with his head bitten clean off, whilst the little boy overwhelms his deliverer with his caresses.

M. Etex displayed several works which exhibited talent and originality of conception in various lines: his two large plaster groups in the Nave—the one representing a family bereaved by the cholera, the other the family of Cain after the murder of Abel—are certainly vigorous efforts, albeit somewhat chargeable with extravagance. His "Hero and Leander" is good in execution, though his figures, particularly the female, are of a heavy mould. Several minor works by the same hand, including some bas-reliefs, have considerable merit.

MURDER OF THE INNOCENTS.—GEETS, OF BRUSSELS.

On the left hand, on entering the Gobelins Room, stood the group, by de Bay, of Eve with her two children, Cain and Abel, in her lap, whom e hugs to her bosom, clasping her hands round her knee, whilst she seems indulge in a reverie as to their future fate. There is something very sturesque and striking in the conception, which is ably carried out, (see bgraving, No. 16, p. 249.) At the base are slightly sketched bas-reliefs of e temptation by the serpent, the sacrifices of Cain and Abel, and the first irder, which explain and give character to the work.

The "Cephalus and Procris" of M. Ramus is a group of some merit, and th considerable expressiveness.

In general, the works of the French school, unequal in individual merit, e interesting, as marking the existence of an educated school, though one which the classic rules have frequently been forgotten. Amongst the y works in which classic treatment has been aimed at, we must mention th commendation Lemaire's Psyche, with the butterfly, in marble, exmely graceful; and Pradier's bronze group of Venus, half kneeling, and hispering to Cupid, and the same artist's Phryne, which stood in front of e entrance of the Gobelins Room, but which was certainly not entitled to the "honour" of a Council Medal: though the jury thought otherwise.

FOREIGN AND COLONIAL DEPARTMENTS.

SWITZERLAND

SWITZERLAND is a federal State composed of twenty-two cantons, which, till 1847, formed independent and distinctive States, possessing a commercial tariff and customs of their own. In 1850, these cantons submitted to a systematic tariff of customs, equally enjoyed by the whole of the confederation: these tariffs are at present undergoing some modifications. The statistical importation and exportation tables of Switzerland, compared with other countries, are extremely uncertain, and in the present introduction and subsequent notes we are frequently compelled to confine ourselves to simple and general facts. Since the 1st of January, 1851, Switzerland has adopted an uniform currency, which is called the federal franc, of the same value and the same subdivisions as the franc of France. They are at present giving their attention to an uniform system of weights and measures, and it is very probable that analogous decimal measures to those of France, Belgium, and Lombardy, will before long be adopted. The quintal is equivalent to 50 kilogrammes, or about 110 lb. avoirdupois.

Switzerland possesses many metallurgical mines, of which only a very small number are worked. Many have been abandoned, owing to the produce of the metals not paying the expenses of working them. Mines are still worked with some advantage yielding the following metals: iron, copper, nickel, cobalt, argentiferous lead and zinc: but not in sufficient quantity for home consumption.

Berne, Soleure, Schaffhausen, St. Gall, Grisons, and Valais, are the principal cantons that produce iron. The iron produced at Berne has a high reputation for its tenacity, malleability, and resistance to fire. During the reign of Napoleon Bonaparte the iron of this canton was much used for the manufacture of gun-barrels.

The manufacture of wire is also of importance, and the celebrated suspension bridge of Fribourg, with a single span of nearly 900 feet, was made of the wire of the Bernese Jura. The canton of Schaffhausen is celebrated for the excellence of its cast and wrought steel, easily distinguished from the other kinds. The canton of Valais possesses many rich beds of iron, which is exported to St. Etienne in France, where it is manufactured into cast-steel. The importations of cast and manufactured iron, zinc, copper, tin, lead, &c., are considerable. These metals come from England, Belgium, France, and various States of Germany, &c.

Switzerland possesses many salt-mines or saline springs: the most important are those of Bâle-Campagne, Vaud, and Argovie. These mines do not suffice for above half the demand.

There are but few coal mines, and these of little value; coals are imported from France. The canton of Neufchâtel possesses some bituminous lime mines, from which they extract asphalte, and export it in small quantities.

Beds of slate, gypsum, numerous varieties of marble, and various minerals, are likewise to be found in this country.

Switzerland has a considerable number of manufactories of earthenware, the produce of which is largely exported from the cantons of Zurich, Berne, and Schaffhausen. The potteries of Winterthour and Schaffhausen are justly celebrated for the beauty and variety of their productions. China, and the finer kinds of earthenware, are manufactured at Vaud, Geneva, and Argovie. The finer earthenware and china is imported from Germany, France, and England.

Switzerland possesses in abundance clay for the manufacture of bricks and tiles, the demand for which, however, is very limited, owing to the low price of stone, slate, and wood. There are about fifteen glass factories, which are employed principally in the manufacture of bottles and glass for windows; the annual importation of glass and crystal is about 20,000 quintals of 50 kilogrammes. Common glass is imported from the Duchy of Baden and Savoy, the finer kinds from France, Bavaria, Bohemia, and England.

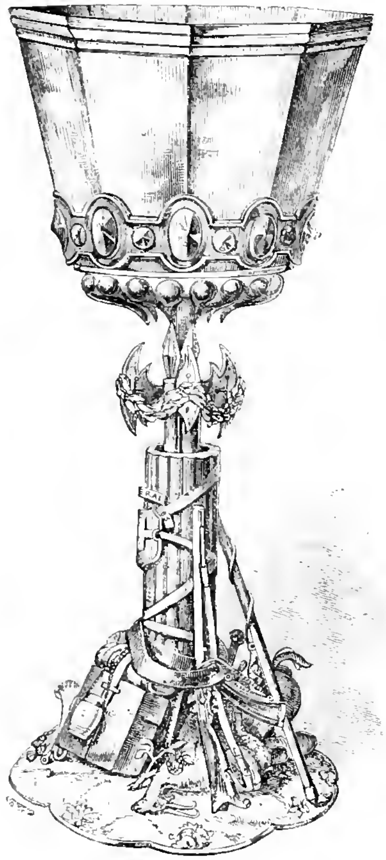
The canton of Soleure is celebrated for its manufactory of flint and crown glass for optical instruments, the superiority of which is so universally esteemed as to be much sought after by the most eminent opticians of Europe and America.

The principal chemical manufactories are those of the cantons of Zurich, Berne, Soleure, Bale, Glaris, and Argovie; the supply, however, is not equal to the demand, and the annual importation from other countries is about 60,000 quintals.

The vine is cultivated in all the cantons, with the exception of Uri, Unterwald, and Glaris.

Several of the cantons have large manufactories of soap, and nearly all manufacture candles; the tallow is imported from Russia. France sends to Switzerland about 30,000 quintals of soap annually.

Switzerland is extremely rich in cattle and other animals. There are about 850,000 oxen and cattle, 500,000 sheep, 350,000 goats, &c., for which her rich pastures and numerous forests are well suited. Although this country is most favourably adapted for the extension of tanneries, this art is not largely or successfully pursued. The enormous duties on the importation of leather into France, and some of the States of Germany, has



SILVER CUP.—FRIES, SWITZERLAND.

had an extremely prejudicial effect on this important branch of commerce; but the present facilities for transport are likely before long to render this trade one of the most considerable and valuable of the country. Her exports are, however, considerable in the skins of oxen, cows, sheep, and goats, tanned and untanned. The exportation to France alone exceeds 800,000 kilogrammes annually. The large skins are held in great estimation for their solidity and durability, and are much sought after for the manufacture of the soles of shoes. A considerable foreign trade is likewise carried on in calf-skins, which are much used by the bootmakers. In the north and west of Switzerland are a few manufactories of chamois leather, morocco, and varnished leather.

Switzerland is also rich in the number of her forests, and the wood that grows in the more elevated portions of the country is highly esteemed for building purposes, much of which is exported into France, Algeria, and Germany. In many of the mountainous districts, and particularly in the Bernese Oberland, the artizans carry on a considerable trade in carved wood, such as furniture, fancy articles, &c., a few of which are exported. Her manufactories in wooden agricultural implements have arrived at a very high state of perfection in many of the cantons. Of these various specimens are shown.

The breeding and care of cattle is one of the most ancient pursuits of the Swiss. The rich pastures of the Alps, the purity of the air and water give that superiority to the Swiss cattle, which they even preserve abroad It is a remarkable fact, that even the cows sent into a warm climate preserve the property of giving a superior quantity and quality of milk; the consequence is, that above 15,000 oxen and cows, as well as 20,000 calves are annually exported to the South of Europe and Algeria.

The Swiss export a considerable quantity of cattle to France. Their breed of horses are noted for their strength and great power of endurance they export from 5,000 to 6,000 annually, as well as about 20,000 sheep The cow-bells and agricultural implements exhibited suggest these facts.

The Swiss cheese enjoys a deservedly high reputation, due to the breed of cattle and the perfumed pastures of the high Alps. They export largely into almost every country. The Cheeses of Gruyère, Emmenthal, and Schabzieger, are held in high esteem, and keep for many years.

Nine only of the twenty-two cantons of Switzerland produce the cereal in sufficient quantity for their own consumption; these are—Lucerne Fribourg, Soleure, Schaffhausen, Berne, Argovie, and Vaud. A considerable quantity of corn, maize, and rice, is imported into Switzerland principally from Germany and Lombardy.

The manufacture of watches is one of the three principal branches o Helvetian commerce; i is not general, but cor fined particularly to th cantons of Genev Neufchâtel, Vaud, par of the Bernese Jura, an the canton of Bâle. Th department of industr has never prospered i any of the other canton and is at present en tirely abandoned.

This fact is entirel owing to local circum stances, and the pro perity of the trade ha steadily and graduall increased, independen either of protective du ties or government pa tronage, whilst in othe countries this manufa ture, supported by go vernment, and an im mense outlay of capita has hitherto never suc ceeded.

The principal circum stances which have cor tributed to its develop ment in the Cantons c Geneva and Neufchâte have been the abur dance of capital, the lo interest of money, chea labour, and the absenc of other trades; the ge neral instruction of th population, with a natu ral aptitude and tast for fine and delicat work, combined with love for commerce, an finally the inclemen and severe winter c the valleys of the Jur

CARVED ESCRITOIRE AND TABLE.—FROM SWITZERLAND

nd the natural love of order, patience, and industry of the inhabitants.

The divisions of labour in this department are so numerous, that the movement of a watch, of the value of 1s., will frequently pass through more than 60 hands.

The Cantons of Geneva, Neufchâtel, Vaud, and Bernese Jura, are calculated to manufacture two-thirds of the watches in the world; the total annual estimation of which is about 1,200,000.

The manufacture of silk in Switzerland is extremely ancient, and dates many centuries back. It received a great stimulus at the period of the Repeal of the Edict of Nantes, when the cruel persecutions of the Protestants compelled a great number of French merchants to emigrate to Switzerland. From this epoch dates the prosperity of this branch of commerce, and at the present period forms one of the greatest sources of the affluence of the country. It is a remarkable fact that, notwithstanding the absence of protective duties, and even circumscribed by many of the neighbouring States by high protective customs, the silk manufacturers have succeeded by energy and industry in overcoming every obstacle.

The silk manufactories of Zurich occupy part of the inhabitants of the adjacent cantons of St. Gall, Zug, Schwitz, and Lucerne. There are about 150,000 looms, of which 95 per cent. work at home on plain and common stuffs, and 5 per cent. on figured silks and shawls. From 20,000 to 25,000 workmen are dependent on this branch of industry. The average returns are from 25 to 30 millions of francs per annum, varying according to the price of the raw material; 75 to 80 per cent. is about the cost; 20 to 25 per cent. is consumed in the process of dyeing.

The greater proportion of the weavers, men, women, and children, are occupied during the summer in the cultivation of their grounds, and take to the loom in winter and leisure hours.

Switzerland ranks next to England, in comparison with the number of her population, in the production of woven and spun cotton; it is likewise one of the countries that consume the most. The production has rapidly increased during a period of thirty years, without any protective duties, and notwithstanding the heavy and severe imposts imposed by surrounding neighbours, on the importation of cotton manufactures. This prosperity is due to the abundance of moving power in every part of the country, the concentration of the population, and her great energy, intelligence, and industrial genius.

Switzerland possesses about 131 looms, which put in motion more than 950,000 spindles; she manufactures all the numbers, up to number 250 (English). The canton of Zurich is the principal seat of this manufacture. The number of factories here amount to 70, while that of the canton of Argovie has only 20.

Switzerland is one of the greatest consumers of spun and wove cotton; the annual consumption is reckoned about 3 lb. weight per inhabitant. Mechanical weaving is increasing yearly, principally in the Cantons of Zurich, Berne, Schwitz, Glaris, Bâle, St. Gall, Argovie, and Thurgovie: there are likewise a considerable number of hand-weaving machines. The canton of Zurich alone reckons more than 20,000 weavers, who annually manufacture more than a million pieces of cotton, of various qualities, at a very low price. There are more than 250 bleaching establishments, the greatest number of which are in the cantons of Berne, Appenzell, St. Gall, and Argovie. The purity, excellency, and abundance of the water is of great advantage to these establishments, as well as to dyers.

CARVED ESCRITOIRE, AND TABLE, FROM SWITZERLAND.

THE Swiss department contained several specimens of wood carving, in decorative furniture and otherwise, which are interesting for the great amount of executive skill displayed upon them, and for the truthful homeliness of the subjects represented in them. They are, indeed, for the most part, sculptured bucolics, exhibiting the pastoral life of happy Switzerland, in all the various phases; whilst a few illustrate other points of nationality, as the costumes of the twenty-two cantons, still kept remarkably distinct amongst the rural population; or some spot dear in the memories of Swiss men, as the chapel of William Tell, at Altdorff. There is something very charming in the simple devotedness to a beloved nationality thus evidenced by a brave, industrious, and primitive people, in their contributions to the world's great and glittering fair. The escritoire, by Wettli, of Berne, which our engraving represents, is in white wood, and intended for the use of a lady: it is so contrived that it can be used either in a sitting or a standing posture. The embellishments, as already stated, comprehend various passages in the industry, field sports, and amusements of Alpine life. The general style of this piece of furniture, considered as such, is light, and by no means inelegant. The small table, by Schild, of Berne, is also extremely pretty, and both are well suited for a lady's boudoir in the retirement of a rural hour.

WORKED MUSLIN COVERLET.—C. STAHELI WILD, ST. GALL, SWITZERLAND.

SILVER CUP.—BY FRIES, OF ZURICH, SWITZERLAND.

WITH the exception of watches, the contributions in the precious metals from Switzerland were rare. The Cup engraved, in oxidized silver, with emblems of war, the national cross, &c., is remarkable more for the curiosity of the devices than for its size or beauty of design.

PAINTS AND PIGMENTS.

Among the numerous metallic colours exhibited, none were more remarkable, either for the beauty of their tints or the great diversity of their applications, than the various salts of lead. Of these the ordinary carbonate, or *white lead*, is by far the most important. It is largely manufactured both in this country and on the Continent, to be employed as a body-colour or ground-work, by means of which other and less opaque pigments may be applied to ornamental purposes. This substance consists of a compound of carbonic acid and oxide of lead, and is annually manufactured in Great Britain to the amount of about 11,000 tons. To make this pigment, none but metallic lead of the purest and best description can be employed; for, should it contain even the slightest traces of any metal yielding a dark-coloured oxide, the whiteness of the ceruse produced would be materially affected, and its value in a proportionate degree diminished. The preparation of this salt may be effected in various ways, but the kind most highly esteemed, both on account of its colour and its covering properties, is obtained by what is usually called the Dutch process, introduced into this country in the year 1780.

In order to prepare white lead by this method the metal is cast either in the form of stars or circular gratings, in order to expose as large a surface as possible to the action of the various chemical influences to which it is afterwards to be subjected. The crates thus formed are placed one above another in the upper part of a conical earthen vessel, something like an ordinary garden-pot, but having about the middle a kind of shoulder, by which the metal is supported above the surface of the dilute acetic acid with which the lower part of the vessel is filled. These pots are then arranged side by side on the floor of an oblong brick chamber, the bottom of which has been previously covered with two or three feet of spent tan, obtained from the tan-yard. The first layer of pots is afterwards covered over with loose planks, and a second range of pots, also imbedded in tan, is placed upon the former; and thus a "stack" is built up, so as to entirely fill the chamber with alternate ranges of the pots containing the acetic acid and metallic lead, surrounded by, and imbedded in, the tan. Instead of tan, stable manure was formerly employed for this purpose, but the darkening of the lead, occasioned by the sulphuretted hydrogen gas which is in this case evolved, has caused the use of that fermentent to be almost entirely discontinued. Several ranges of stacks occupy each side of a covered building, each stack containing about 12,000 pots, and from 50 to 60 tons of metallic lead. Soon after the stack has been built up, it begins to "work," or ferment—large quantities of steam and vapour being at the same time evolved from the various apertures or spouts which are left in the tan for that purpose. The internal temperature of the heap now rapidly rises until it attains from 150° to 180° Fahrenheit, and considerable quantities of watery vapour and carbonic acid gas are at the same time evolved. By this means the acetic acid contained in the bottoms of the pots is slowly volatilised, and its vapour, passing through the interstices in the leaden gratings, gradually corrodes the surface of the metal, on which a crust of subacetate is rapidly formed. This is quickly decomposed by the carbonic acid continually given off from the fermenting tan, which liberates the acetic acid to combine with a fresh quantity of oxide of lead—whilst the first is converted into ordinary white lead, which adheres firmly to the central portion of the metal, which still remains unattacked.

In the course of from six to ten weeks the process is completed, and on unpacking the stacks, the lead is found to have undergone a remarkable change: for although the form of the castings is still retained, they are converted, with considerable increase of bulk, into dense masses of carbonate of lead. This conversion is complete when the operation has been very successful: but in most instances a certain quantity of metallic lead remains unattacked in the centre of the mass, and from this the exterior coating is readily separated by passing the crates between properly constructed rollers, by means of which the outer crust becomes crushed and falls off. The white lead thus separated is then transferred to a series of mills, where it is ground into a thin paste with water, and alternately reduced, by the process of successive washings and subsidences, to the state of an impalpable paste. It is now taken from the cisterns where it has been allowed to settle, and placed in earthen bowls, in which it is removed to the shelves of large drying stoves, heated by a series of steam pipes; and there, in the course of about a week, it is brought to the state of masses easily rubbed between the fingers into a fine powder, and in which the most powerful microscope does not enable us to discover the slightest trace of a crystalline character. If intended to be made into paint, the dry white lead is now mixed in a pug-tub with refined linseed oil, and is subsequently passed through a mill, by means of which its particles become more thoroughly incorporated with the oil.

From the large quantities of spent tan used in the manufacture of this article, it will be inferred that the establishments in which it is prepared are chiefly to be found in the neighbourhood of towns in which tanning is extensively carried on, and where the refuse from the tan pits is consequently to be procured at a cheap rate.

The ordinary work of white-lead factories, such as building and taking down the stacks, is almost entirely carried on by women, a very large proportion of whom are Irish, whose weekly earnings vary from 9*s.* to 11*s.* The persons working on white lead are, however, extremely subject to peculiar diseases, occasioned by the absorption of this metallic poison into the system; and unless great attention is paid to its removal from the skin when the hours of work are over, it frequently occasions muscular contractions, by which the use of the affected limb is entirely and permanently lost.

Besides being made by the method above described, white lead is also sometimes prepared by precipitation from the salts of that metal; but when thus obtained, it is deposited in a crystalline form, very unfavourable to its covering properties, and is consequently much inferior for almost every purpose to that manufactured by the Dutch process.

Among the specimens of this substance exhibited, we observed samples from Messrs. Russel and Robertson, of Holytown, Lanarkshire; and also from Messrs. Pontifex and Wood, of Shoe-lane, London, who displayed a series of examples illustrating the manufacture in all its stages, beginning with the crude galena or lead ore, and ending with specimens of the prepared pigment in its finished state.

In the various foreign departments of the building, numerous specimens of this substance were also exhibited, among them samples from Austria, Belgium, France, Germany, Bavaria, Saxony, Holland, Sardinia, the United States, and China.

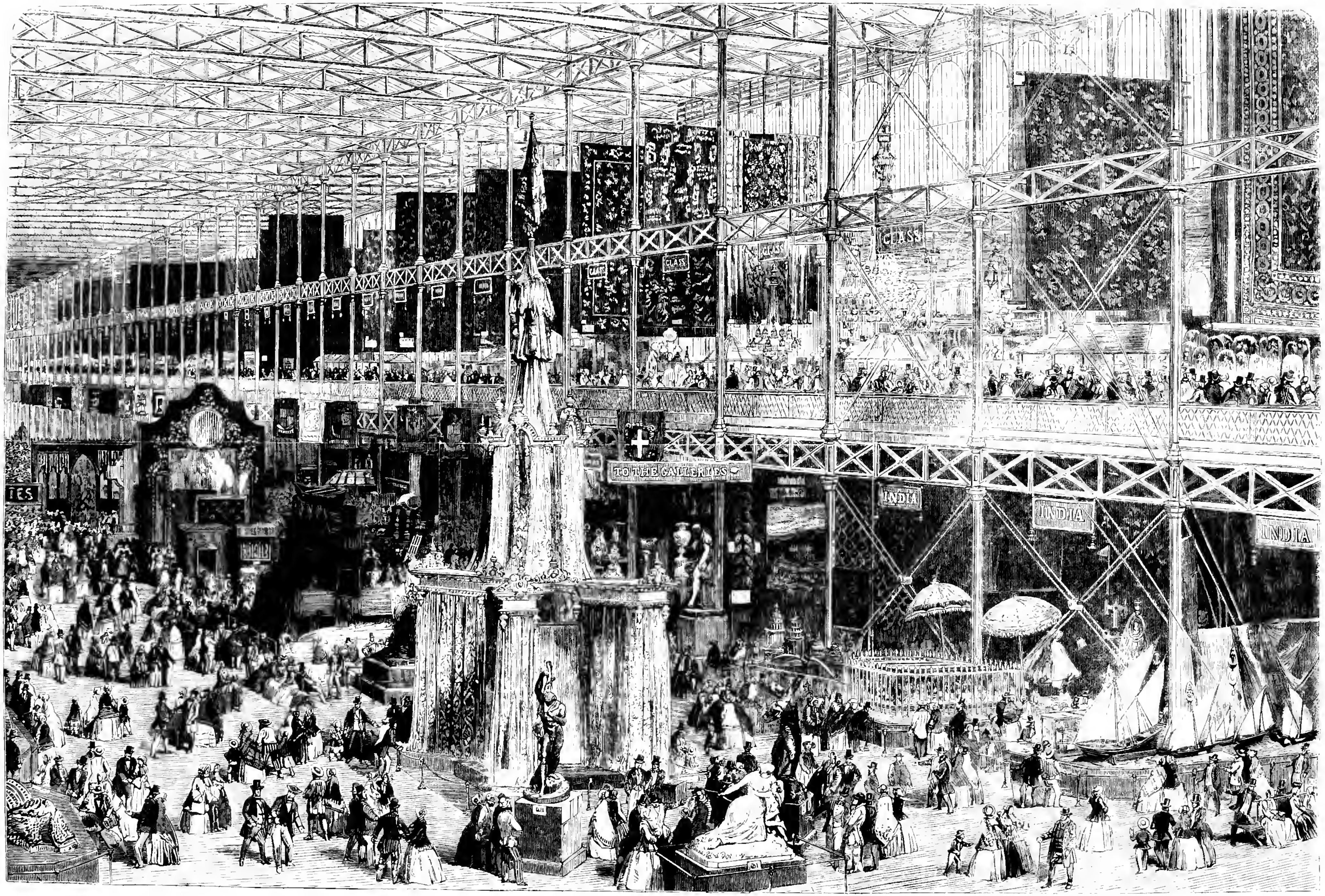
There were also exhibited two different illustrations of the *oxichloride of lead*, and also numerous examples of oxide of zinc, or zinc white, both from this and other countries—although the larger proportion came from Belgium, where the metal is produced in considerable quantities, particularly from the mines and metallurgic establishments in the neighbourhood of Liege. This substance when ground into paint, has many advantages, but many defects. We now proceed to the examination of the other very numerous preparations of lead employed by the painter and artist for various ornamental purposes. Among the most important of these may be classed the various red and yellow colours obtained by the combination of chromic acid with oxide of lead. The yellow varieties known by the name of *chrome yellow* are prepared by the addition of bichromate of potash to solutions of the soluble salts of lead; and the different shades observed in the numerous specimens shown, are obtained either by varying the proportions of these two ingredients, or by the addition of an acid or alkali to the solution of bichromate of potash before it is added to the lead salt. The price of these preparations is entirely regulated by their purity, as it is usual to adulterate them largely either with sulphate of baryta or Paris white. The better kinds sell for about 1*s.* per pound, whilst the same quantity of some of the most adulterated chromes may be obtained for 3*d.*; in which case, although the casual observer would notice but little difference between them and the pure varieties, they consist principally of Paris white, stained only with chromate of lead. These colours, like most of the other salts of lead, are liable to become blackened by exposure to sulphuretted hydrogen gas, but are not perceptibly affected by light alone. Some of the commoner kinds, notwithstanding that they contain a poisonous salt, are also largely sold for colouring ground mustard, the appearance of which has been previously impaired by copious adulteration with flour, oatmeal, pepper, or other less wholesome commodities.

Red chromate of lead, more commonly called *Persian red*, is a bichromate of the oxide of that metal, obtained by boiling a proper amount of bichromate of potash with finely-divided carbonate of lead, until it has acquired a deep red colour—when the brilliancy of the tint is further heightened by the addition of a small quantity of strong sulphuric acid, totally free from any metallic impurities.

The mineral blue colours, of which numerous examples were to be found in the case belonging to Messrs. Pontifex and Wood, as well as in those of Messrs. Blundell and Spence, and Windsor and Newton, are for the most part compounds of iron and cyanogen. They are prepared by the addition of a salt of iron to a solution of ferrocyanide of potassium, usually known by the name of prussiate of potash, a yellow salt of which the chemical section contains several fine specimens. The colours thus obtained are known in the trade under the names of *Chinese or Prussian blues*—the only difference existing between the two being occasioned by the admixture of a certain portion of alumina with the latter kind. The alumina in this instance merely serves to dilute the colour and give it additional weight, and the better kinds are consequently such as are entirely free from any mixture of this earth. These blues, besides being extensively employed by painters and artists, are used in large quantities by paper-makers and paper-stainers; the former of whom by this means communicate a blue tint to writing paper, whilst by the latter it is not only employed as a simple colour, but also in the preparation of green pigments of various shades and tints.

Of the mineral greens, a large portion of those exhibited consisted of various samples of the colour known in commerce as *Brunswick green*. This substance is prepared by mixing together in variable proportions the yellow chromates of lead and Prussian blue—more or less sulphate of barytes or Paris white being at the same time added, in accordance with the shade and strength of the colour intended to be made.

In addition to these were numerous greens which derive their colour from the salts of copper, of which many of them entirely consist. Among them may be mentioned *Scheele's*, or *emerald green*, the verditers, and



VIEW IN THE WESTERN NAVE.—KEITH'S SILK TROPHY, &c.

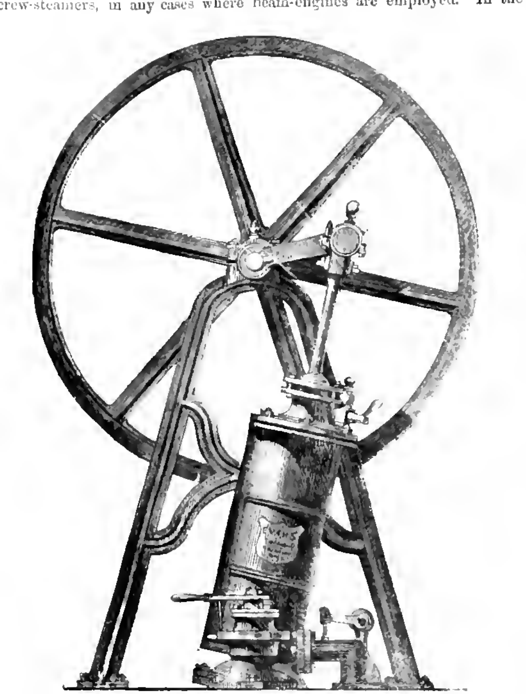
MACHINERY DEPARTMENT.

MARINE STEAM-ENGINES.

THE collection of steam-engines exhibited, though by no means so full as could have been desired, comprised many remarkable models, more particularly relating to recent improvements. A complete collection of working models, from Watt's first steam-engine down to the most recent improvements, would be an exhibition in itself, and one of incalculable value and interest. Perhaps, on some future occasion such a scheme may be carried out; but it will require the zealous co-operation of many hands.

On the present occasion we shall pay attention to the exhibited engines for ship propulsion.

Among the articles of this class exhibited, we first noticed a pair of marine engines sent by Mr. Atherton, of Devonport, which are intended by him to be applicable, with slight alterations, either to paddle-wheel or screw-steamers, in any cases where beam-engines are employed. In the



STEAM ENGINE.—EVANS.

case of these engines, it is proposed to substitute one single beam overhead for the pair of beams usual in the older forms of marine engines. The parallel motion is also dispensed with, and one end of the beam is attached to a trunk piston, the other to the connecting-rod and crankshaft. Two air pumps are used, one at each end of the beam, with a view of balancing the work. There is a variable expansion-gear fitted to the engines, capable of adjustment during the time they are working. In connexion with these engines of Mr. Atherton, we may allude to a plan proposed by that gentleman, which has already attracted considerable notice, of marine engine classification, which he considers essential to the increased efficiency of steam-fleet service. The system which he recommends for adoption consists of a limitation of the number of engines, arranged according to the gradation of sizes, to cylinders of ten, twenty, thirty, forty, fifty, sixty, seventy, and eighty inches diameter, constructed with a view to the complete adoption of the expansive principle, upon the same plan as the pair of engines which he exhibits; and which, he considers, will afford all the varieties of power now commonly in use, and meet the probable requirements of steam-ship service, both commercial and national. The advantages which he states would result from an application of the system to the steam marine, would be, that the arrangements of the machinery of all vessels would be similar in their nature: new ships would no longer be experimental in their character, but their results would be certain; foreign ports could be supplied with the means for meeting all probable contingencies connected with the machinery; the weights and properties of each class of engines would be properly and accurately ascertained and defined, and could be specifically contracted for. The subject is one deserving of serious consideration on the part of those who are interested in the management and increased efficiency of our steam marine, whether for commercial or national purposes.

We come next to a pair of 50-horse power engines, for a screw boat, sent by Messrs. Stothert and Slaughter, of Bristol, on Mr. Slaughter's patent. Here the cylinders are inclined at an angle of about 45 degrees, fixed at the top of the frames, and tied together by a cross-bar of the frame. The connecting-rods both work direct on to one crank-pin attached to the main screw shaft, which is intended to run 120 revolutions per minute; and at the back of the engines the screw itself is shown on the shaft. It is of gun metal, and with three blades instead of two, as is more usual; but it is worthy of remark as the only fu sized screw sent to the Exhibition. The arrangement of the air-pumps is vertical; and it is peculiar, inasmuch as, instead of their buckets making as many strokes as the pistons of the steam cylinders, their speed is reduced by a wheel and pinion to one-third the number, in order to allow them to work quietly with metal valves: the crank-pin which works them is fixed in the toothed wheel, and the motion is communicated by bell-crank levers, which also work the feed-pumps and bilge-pumps We under-tand that a pair of engines identical with these have been worked for some time in the Bristol Channel, with considerable success. Messrs. Stothert and Slaughter claim on behalf of their engine the following advantages:—High speed upon the screw shaft, in connexion with slow speed of vacuum apparatus, in the same machine. They state that there is no reasonable limit, on the one hand, to the high speed required for the screw shaft giving facility for securing the best form and angle for the propeller, nor, on the other, to the reduction of speed required for vacuum apparatus, with the diminished risk of accident resulting therefrom They also state, that, by their arrangement, a considerable saving of power is effected, by reason of the relatively reduced proportion of the vacuum-pump, and the consequent saving of fuel.

The next in order were a beautiful pair of screw engines, of the united power of 700 horses, being some of the largest yet made for that purpose. They were sent from the well-known establishment at Soho, of Boulton and Watt, now carried on in the name of James Watt and Co. There are four horizontal cylinders—the cylinders each of 52 inches diameter and 3 feet stroke, 65 strokes per minute; the screw itself is 16 feet diameter, and makes the same number of revolutions. The cylinders are coupled in pairs direct on to one shaft, which is cranked in the middle to work the two air-pumps which are fixed in an inclined position between the steam cylinders and below the platform, where the starting-gear is worked. The condensers are also between the cylinders. The bilge and feed-pumps are worked from a light crankshaft at the forward end of the engines, and are very easy of access. The air-pump valves are of vulcanised Indian rubber. The link motion is applied to work the slide valves, and the whole arrangement is simple and compact. The great difference of opinion which exists amongst engineers in their arrangements of engines is strikingly shown by contrasting the engines of Messrs. Watt and Company with those of Mr. Atherton. In Messrs. Watt and Company's engine two air-pumps are used to force steam cylinders, while, in Mr. Atherton's, four air-pumps are used to two steam cylinders.

Two very curious and interesting models were shown by Messrs. Watt and Company. One of them was a model of an oscillating cylinder engine, made in 1785, at the Soho manufactory; the other a model, of the same date, of a locomotive engine, also made at Soho: they are both illustrative of Mr. Watt's patent.

The engines sent by Messrs. Penn and Son, of Greenwich, included a pair of 16-horse engines with oscillating cylinders, of their usual size and pattern, as fitted into the numerous river boats on the Thames, and were a most excellent sample of workmanship and proportion. They were fitted with two different paddle-wheels, to show the variety—one being that of the common wheel with fixed floats, and the other a wheel with "feathering" paddles, similar to those made where great speed is required. Some of the very fastest of the steam-vessels on both the Dover and Holyhead stations are also fitted with this sort of engine, but on a much larger scale. The celebrated Banshee is one of them. Engines on this plan have also been fitted into the Queen's yacht Fairy, but with a screw instead of paddle-wheels. Another class of engines sent by this firm was a pair of 30-horse engines for the screw propeller, being horizontal trunk engines with fixed cylinders. In these engines simplicity of arrangement is studied and carried out to a very remarkable extent. The connecting-rods are attached to the centre of the pistons at one end, and to the crank shaft at the other. They are intended to run 115 revolutions per minute. The air-pumps are fixed in the condenser, and are worked direct from the pistons, each by a horizontal rod working through stuffing-boxes in the cylinder cover and the pump cover: they are, of course, horizontal, and are double acting, so that their dimensions are reduced to a minimum consistent with their effective action. Their valves are made of vulcanised Indian rubber, and, although worked at great speed, are quite noiseless. The feed-pumps are worked in a similar manner, but are single acting only, as this is more convenient. All the parts are easily got at, and the starting and reversing gear is very conveniently placed. Engines on this plan, but of much larger size, viz., 360-horse, have been fitted to her Majesty's steam frigates

natural green, or ground malachite. Scheele's green is an arsenite of copper, prepared by adding a hot solution of arsenite of soda to a nearly saturated solution of sulphate of copper, which for this purpose should be perfectly pure, and, above all, entirely free from any metallic impurities, by which the colour of the resulting precipitate would be liable to become affected. When the precipitation of the copper salt has been completely determined, a certain portion of acetic acid is added to the mixture; this liquid has the property of greatly adding to the brilliancy of the colour produced, but in what precise way this is effected, chemists have not, as yet, satisfactorily determined. The colour thus obtained is of a most beautiful and delicately green tint, but possesses little body, and is therefore not much used except by paper-stainers and the manufacturers of fancy paper articles. This pigment, like most of the other compounds of copper and arsenic, is of a highly poisonous nature, and the most lamentable results have in more than one instance resulted from its employment in the colouring of the fancy sweets with which twelfth-cakes, &c., are occasionally ornamented. *Verditer*, although of a green colour, is far less delicate in tint than that just described; it is made by the addition of milk of lime to a solution of sulphate of copper, and is chiefly employed by paper-stainers in the preparation of the commoner kinds of coloured papers.

Natural green, or *powdered malachite*, is exclusively employed by artists, and is therefore not made in large quantities. It is obtained by grinding to the state of an impalpable powder, the fine green carbonate of copper, of which very beautiful specimens were shown from Cornwall, Russia, France, and particularly from some of the South Australian Copper mines. This, from the scarcity of pure samples of green copper, and the smallness of the quantities manufactured, is an expensive colour, and it is consequently never employed either by paper-stainers or house-painters.

Among the finer colours attention may also be drawn to the substance known by the name of *vermillion* or *cinnabar*. This is a compound of sulphur and mercury, which occurs in nature as a common ore of quicksilver, and is prepared by the chemist as a pigment under the name of vermillion. This substance is, chemically speaking, a bisulphuret of mercury, and being, on account of the beauty of its colour, extensively employed in painting, making red sealing-wax, and for many other purposes, the preparation of the artificial variety has become the object of an extensive and important manufacture.

The usual process is to beat together, in a large earthenware or iron pot a mixture of sulphur and metallic mercury, in the proportion of 150 of the former to 1,080 of the latter. When vermillion is prepared by sublimation it forms into masses of considerable thickness, concave on one side and convex on the other, of a needle-form texture and brownish red colour. On being finely pulverised, however, this substance assumes a lively red colour, of which the brilliancy in a great measure depends on the fineness of the state of division to which the sulphuret is reduced.

This pigment—which, like most of the other mercurial compounds, is highly poisonous—is volatile at a red heat without leaving any residue. This circumstance is therefore taken advantage of for the purpose of testing the purity of commercial samples of vermillion, which—being frequently adulterated with red lead, dragon's blood, brick dust, and particularly with Persian red—would, if impure, leave these matters behind when heated to the subliming point on a piece of hot iron plate. Large quantities of this colour are annually consumed by artists, painters, and paper-stainers; but like many other metallic compounds it is liable to blacken if exposed for a long period to the direct action of the solar rays.

Among the finer and more expensive colours the different varieties of *lake* deserve special notice. Under this title are comprised all those colours which consist of a vegetable or animal dye, combined by precipitation with a white earthy base, which is usually alumina. The general method of preparation is to add to the coloured infusion a solution of common alum, or rather a solution of alum saturated with potash, especially when the infusion has been made by the aid of acids. At first only a slight precipitate falls, consisting of alumina and the colouring matter; but on adding potash a copious precipitation ensues, of the alumina associated with the dye. When the dyes are not injured, but on the contrary rather improved, by the presence of alkalies, the above process is reversed; the decoction of dye-stuff is made with alkaline liquors, and after it is filtered a clear solution of alum is rapidly poured into it. The third process is applicable only to substances having a great affinity for subsulphate of alumina; it consists of agitating recently precipitated alumina with a decoction of the dye.

Yellow lakes are coloured either with decoctions of French or Persian berries, quercitron bark, or annatto; the red and scarlet lakes from cochineal or madder; and a kind of brown lake is prepared from the liquor obtained by the maceration of finely-chopped Brazilwood.

Carmine is merely another name for an exceedingly brilliant and expensive variety of lake, in which the colouring principle is derived from cochineal, which is the female of a species of insect very abundant in Mexico, where it is found adhering in large quantities to the young shoots of the cactus opuntia, or nopal tree.

Among the specimens of these substances exhibited, some beautiful lakes and carmines, manufactured by Messrs. Godfrey and Cooke, could not fail to be admired. There were also examples of lake, carmine, orchil, cudbear, lacdyes, and turmeric, by Mr. J. Marshall of Leeds, which were well worthy of attention.

In various parts of the section, as well as in many of the foreign departments of the building, were found specimens of both natural and artificial *ultramarine*. The natural variety of this most beautiful blue is prepared by reducing the mineral called lapis-lazuli to an extreme state of division, in which form it furnishes the artist with a most valuable and expensive pigment. Artificial ultramarine is much inferior, both in colour and durability, to the natural product; but it is still a very beautiful colour, and is prepared in large quantities for the use of painters and paper-stainers. This substance is manufactured chiefly in Germany, where it is made by the fusion of a mixture of several earthy matters, together with sulphur and carbonate of soda. The theory of the production of this body is as yet but imperfectly understood; but its beautiful blue colour is supposed to be in some way connected with the reaction of sulphuret of sodium on silicate of alumina, of which both the natural and artificial varieties contain a considerable amount.

The natural ultramarine is one of the most permanent colours with which we are acquainted, but there is still much uncertainty with regard to the durability of the artificial variety. A very general impression, however, exists that, when mixed with the organic matter used as a vehicle for its application, it will at length be found to change.

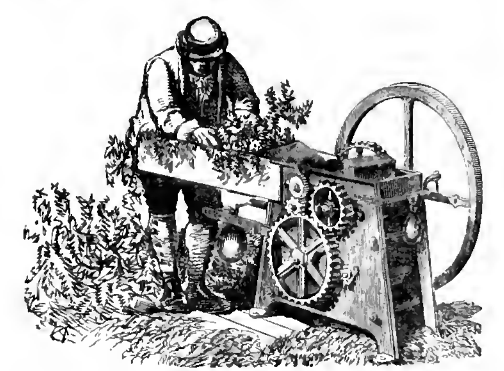
There were likewise among the chemical products various specimens of *cobalt blue*, or *smalt*—a colour which, although less brilliant than ultramarine, is peculiarly useful for the purpose of painting in enamel and colouring glass, to which the most minute quantity of the oxide of cobalt imparts a very decided blue tint. This substance is essentially a silicate of cobalt, and is prepared by fusing together, in a reverberating furnace, a mixture of oxide of cobalt, white sand, and carbonate of potash. The fused mass is afterwards powdered and washed in hydrochloric acid, for the purpose of extracting the alkali, which, if allowed to remain, would cause the smalt to lose its colour and assume a black tint on exposure to the atmosphere. A great portion of the smalt manufactured in this country is prepared from the cobalt separated from nickel, used at Birmingham in the preparation of German silver; this is chiefly sent to the Staffordshire potteries, where it is employed for painting on porcelain and common earthenware.

The collection of colouring-matter exhibited also contained numerous examples of organic stains and dyes, but as these should rather be considered in connexion with the process of calico-printing than among the ordinary pigments, we shall reserve for a future occasion our notice on this subject.

BARRETT, EXHALL, AND ANDREWS' GORSE BRUISER.

THE introduction of gorse as food for cattle is every day gaining ground. There are times and situations when gorse is a most valuable article to cattle-feeders, its nutritious qualities being of the highest class. Various noblemen and gentlemen have used it with advantage, and made a variety of experiments, always with satisfactory results, more especially with milch cows and sheep.

The great obstacle in the way of general introduction is the difficulty of



getting rid of the hard points or prickles in which the nutritive juices of the plant are contained. Until these are entirely destroyed, no animal can swallow it; though, when they are destroyed, any horse, cow, or other herbivorous animal, will eat it with avidity, and prefer it to any other food, even though the animal may have never tasted it before.

The old practice was to subject the gorse to the action of heavy edge-stones (as in a cider mill), until the introduction of a proper machine by Messrs. Barrett, Exhall, and Andrews. This machine both cuts and bruises the gorse, and delivers it for use quite soft and much like long moss, in which state, of course, any animal can eat it without inconvenience.

gant and Encounter, and their performances have been in the highest e satisfactory. Altogether, they may be considered as great a simplion of parts compared with the previous simple oscillating engine now sively used by all engineers, as the oscillating engine itself is allowed simpler than the old beam engine, which was universally used in -vessels until a few years since, and which is not yet abandoned in few instances.

comparison of the relative advantages of paddle wheels and screw ellers was forced upon the notice of the observer here, by the close mity of pairs of first-class engines by the same maker; and when it is in mind that one was a pair of 16-horse power, and the a pair of 30 horse—each of the highest degree of excellence rangement—it must be allowed that the screw propeller ts of the forms of engine most easily adapted to steamls, and of much greater lightness and simplicity of contion, besides possessing that important requisite for vessels r—the having all the parts below the water-line.

addition to the engines themselves, models were shown of runk engines, and of a pair of large oscillating engines, of orse power, as fitted into her Majesty's steam-ship Sphynx; t may not be amiss to notice here that a pair of these latter at the time being fitted into the Great Britain, at Liverpool, there can be little doubt that they will give a satisfactory t in that well known vessel.

"donkey" engine, or steam feed pump, was also shown in ollection. It was a good sample of an article which is indisble now that tubular boilers are so universal. It may, howbe noticed that the relative sizes of cylinder and pump may ry much modified for high pressure purposes, as a much er excess of cylinder area may serve for high than for low ure. The same exhibitors also showed the model of the of her Majesty's ship, Arrogant.

number of variously shaped screws for propelling vessels were ited by Captain Smith, whose efforts to introduce this n have been most unceasing for many years past. The r forms generally consist of a much greater length of screw s now found to be necessary; and nothing is more surprising to ne who investigates the matter for the first time, than to see ery small surface necessary to absorb the whole power of a pair of engines, and to transmit the force required to propel essel.

ong other models of screws shown by this gentleman, those of the actual propeller used by Mr. Smith in his imental boat of 6-horse power, in 1836-7, on the PaddingCanal, and with which she performed the first sea trip made with a screw propeller. Also we saw the screw, es diameter, made by Mr. Smith, and applied to his model working in 1835. The *fac-simile* of a model of the screw propeller of her ty's steam yacht, Fairy, presented by Mr. F. P. Smith to her Majesty, ard the Great Britain steam-ship, at Blackwall, on the 22nd of April, was likewise shown.

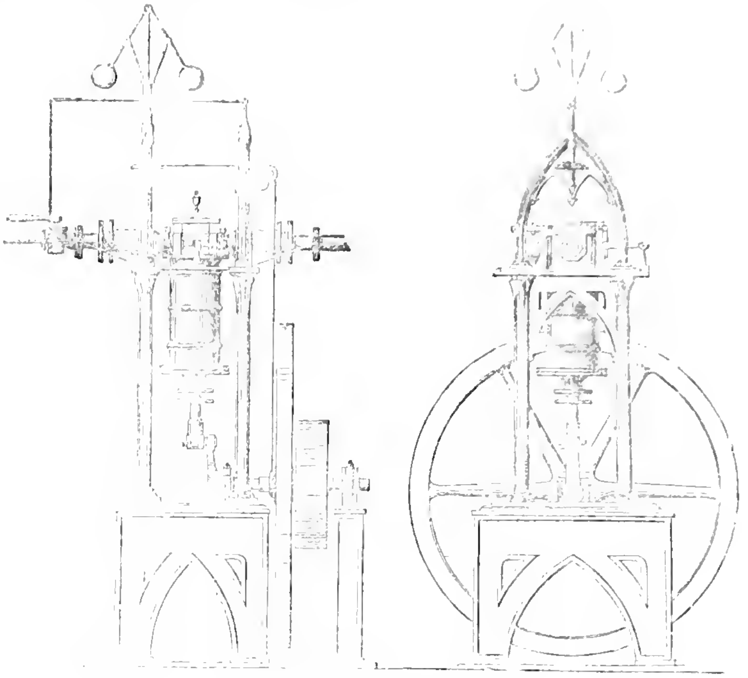
o models of marine engines sent by the firm of Maudslay, Sons, and , were of the most complete and beautiful description of engines made em. First in order was a pair of beam engines of the kind made by for many years, and fitted in many of the ships in the navy, but which ow generally superseded by other forms of engine—as, for instance, scillating cylinder engines, of which a pair was exhibited in model. our cylinder engines patented by them are, however, the kind generally by this firm for large vessels, and very many of them have been made vorked for years with the greatest success—amongst other vessels, in ueen's yacht, the Victoria and Albert. The cylinders are fixed upright, n the tops of the piston rods are placed wrought-iron "T" pieces, rise and fall with the motion of the pistons; and to the lower end ch "T" piece is coupled the bottom end of the connecting-rod, the eing attached to the crank. This arrangement allows of a much larger ecting-rod being used than is usually possible with direct acting engines; lso, in the case of very large engines, it reduces their separate parts to geable weights and sizes, while the total room occupied is much less that required by beam engines. The air pumps are worked by a ate pair of levers, and these latter also serve for the feed and bilge s. Very little framing is required for these engines, except the headwhich carries the paddle shafts.

e "annular" cylinder engines, patented by Mr. Joseph Maudslay, were ited. This description of engine has been fitted into several of the ls trading between Folkestone and Boulogne, as well as in others. are somewhat similar in appearance to the trunk engines before ibed, but with this difference—that the internal cylinder is a fixture, wo piston rods are necessary to connect the piston to the "T" piece, as in the trunk engines there is no piston rod. The lower end of this piece moves up and down in guides placed in the hollow of the internal ler, which has no cover. The connecting-rod is attached to it and the , as in the double cylinder engine.

other class of engine shown in model was a sort of "steeple" engine, iarly adapted for shallow river boats, such as are required on the es; and several have been fitted to vessels on that river.

e most recent arrangement of Messrs. Maudslay's engines was shown ery compact and simple model of a pair of engines for working the screw propeller. The two cylinders are horizontal, side by side with the connecting rods, jointed on to the cross heads at the ends of the piston rods, and coupled on to two cranks at right angles to each other; the air pumps being vertical, and each worked by two eccentrics at the back of the two cranks, the rods from which descend and lay hold of the air pump "cross-head."

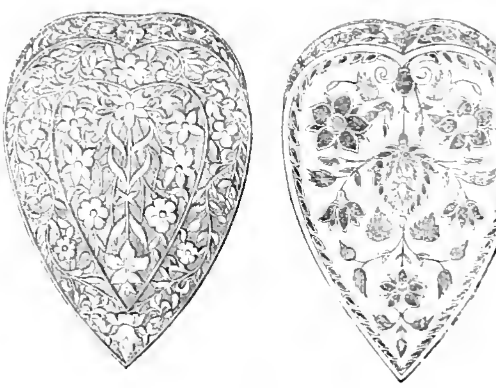
The same simplicity of parts of the screw engines, as compared with the paddle-wheel engines by the same makers, was found here, as has been alluded to before; and, the whole of the models being usually put in motion, their remarkable excellence of workmanship and proportion was set off to the greatest advantage.



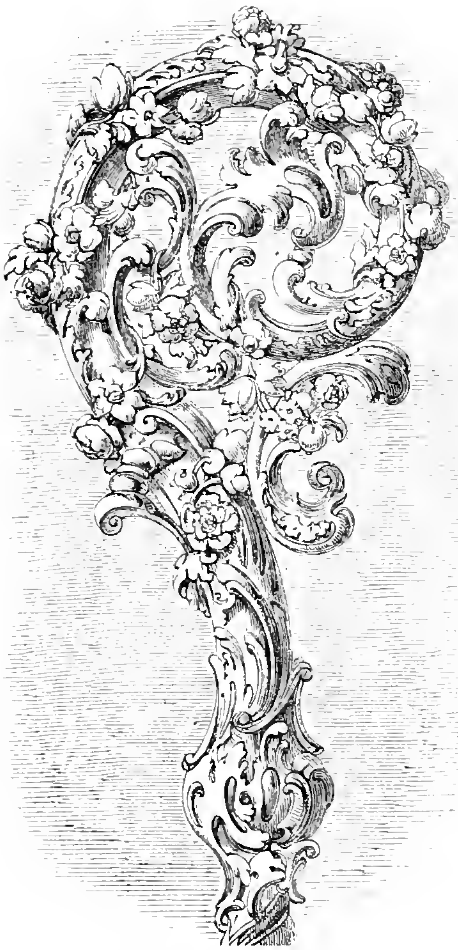
JOYCE'S STEAM-ENGINE.

Mr. Taplin, of Woolwich dockyard, exhibited a model of a plan for lowering and raising vertically the funnels of large steam-vessels when sailing only. This, and other plans somewhat similar, now extensively used, are classed under the name of telescopic funnels, and most of the Government ships are thus fitted.

Mr. Stevens also showed a rough model of a new system of surface propulsion, termed by the inventor the "fan paddle-wheel." It is to be regretted that want of time prevented a more complete model of the invention being sent; for we understand that several nautical authorities have expressed a high opinion of the merits of the invention, and even consider that, applied to our fast steamers, the "fan paddle-wheel" would enable them to make the voyage across the Atlantic in from one to two days' less period than at present. The invention consists of a continuous propelling surface, composed of a series of paddle-blades, or segments, radiating from the centre, and joined side by side from thence to their outer extremities—which, when in motion, enter, pass through, and leave the water at inclined angles, thus dividing or compressing the water alternately right and left.

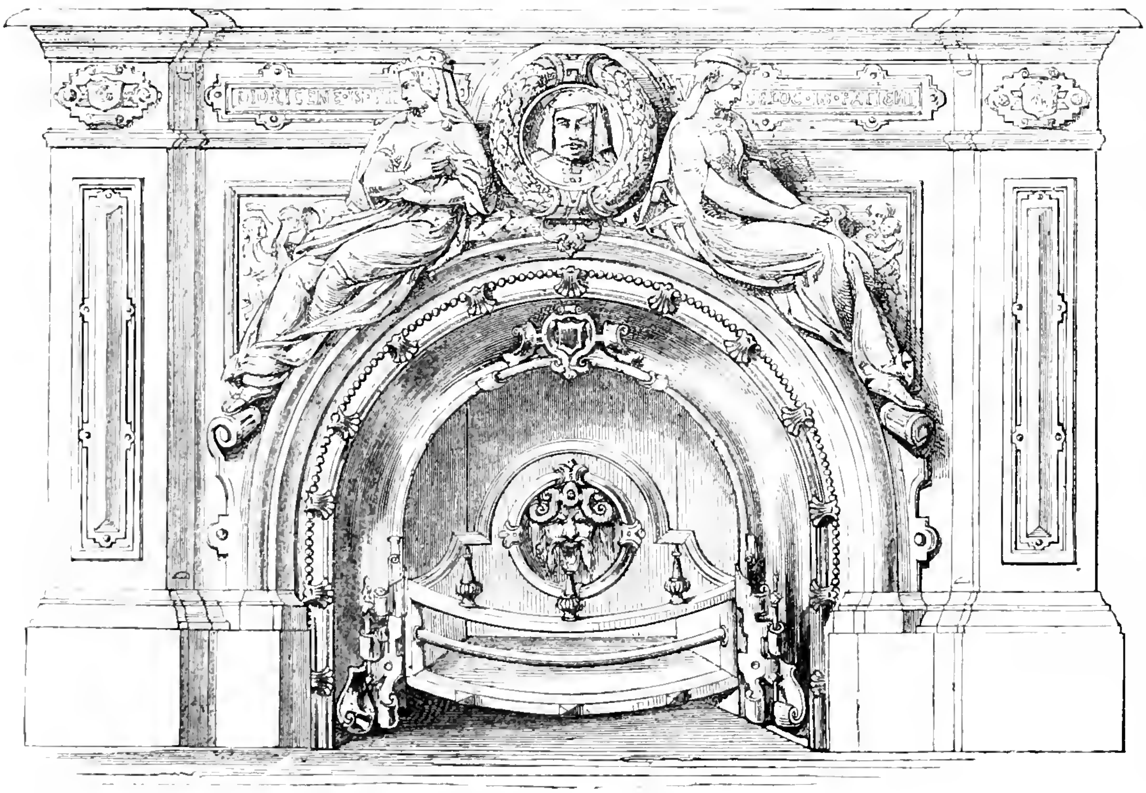


JEWELLED BOXES.—EXHIBITED BY THE EAST INDIAN COMPANY.



CARVED CROSIER HEAD.—ROGERS.

ORNAMENTAL LEATHER.—DULUD, PARIS.



MARBLE FIRE-PLACE.—JOHN THOMAS. STOVE.—FEETHAM.

RELIEVO LEATH

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in this department of art manufacture. An able writer, while dwelling much gusto upon this subject, says, the distinct relief in which the rns could be embossed, the brilliancy of colour of which the leather usceptible, the high burnish which could be given to the gold, the bility, ease of application, and resistance of damp, rendered the material iarly fitted for panels and hangings. It was a warm and gorgeous ing for the walls, affording infinite scope for art, taste, workmanship, heraldic emblazonment, and the exclusiveness of wealth, and was fore largely used in the decoration of palaces baronial halls. At Blenheim, Hinchinbrook e, Norwich Palace, Knockton Hall, at Lord borough's, and in many private collections, er tapestries are still to be found, preserving tmost brilliancy of colour and gilding. Some e leather tapestries at Hinchinbrook, it is said, the name of Titian. About 1531 or 1532, y VIII. built a manor-house near Eastham ch, in Essex, with a high, square tower, that g her sort of year of probation Anne Boleyn t enjoy the prospect of the Royal Park at nwich. This tower had hangings of the most eous gold leather, which remained until fifty since, when the house coming into the hands of prietor with no especial love for the memory e Bluff Harry, nor the sad hauntings of the of Anne Boleyn, nor the old art and workman- of leather decoration, but a clear perception in so many yards of gilt leather there must ome weight of real gold, had the tapestries down, sent to the goldsmith's furnace, and some worth of pure gold gathered from the ashes.

the French department, No 1202, M. Dulud, of , exhibited several pieces of tapestry and nental hangings in embossed leather, which ar identical in subject and the method of their aration with those of Mr. Leake in the Fine Court. He likewise showed two elbow-chairs, with embossed leather, and other articles of ture similarly decorated, amongst which a et was the best, and which served admirably to the fitness of leather where the appearance of rate carving is required. Opposite to these was . 164, A. A. Despreaux, a collection of Vene- leathers of similar pretensions, but differing idely as possible in their result. The patterns ted as models are well known by us to be very rably adapted for the purpose; but whether sguise the original source, or from inefficiency e operatives, nothing could have been more otent than the conclusion, and scarcely any- g more execrable in taste, than the method in h they are daubed with colour. All drawing, race, and all notions of chromatic harmony are to the winds. If these in any way resemble decorated leathers at the period of their decline ultimate abandonment, we can scarcely wonder e total extinction of this branch of art manufacture in those countries h were eager to appreciate it in its palmy days.

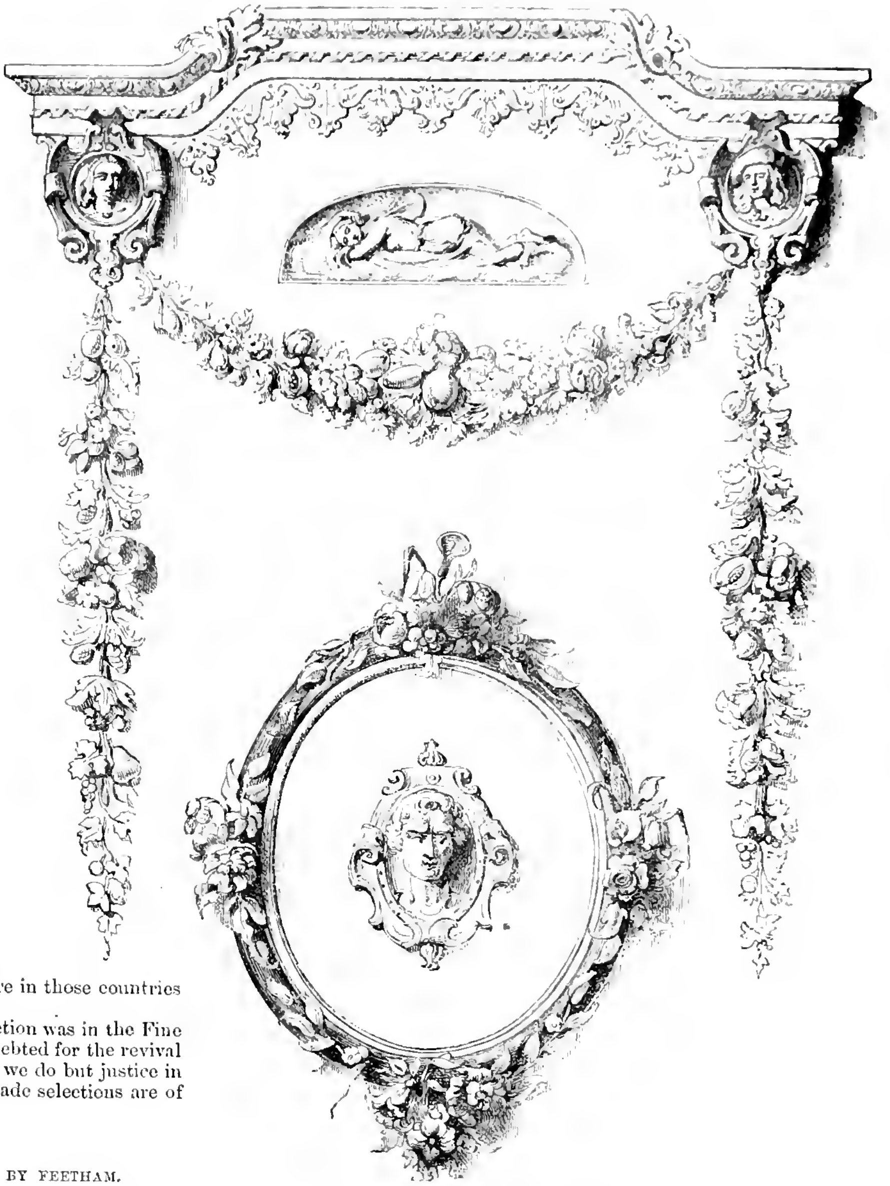
r. Leake's (of Warwick-street, Golden-square) collection was in the Fine Court. To this exhibitor's perseverance we are indebted for the revival is branch of art manufacture in this country; and we do but justice in ng, that the models from which he has hitherto made selections are of very best and most classic styles.

MARBLE FIRE-PLACE, BY JOHN THOMAS—STOVE, BY FEETHAM.

HESE are altogether very handsome productions. The fire-place, in white ble, is very elegantly carved; the figures being a bust of Chaucer in centre, and the virtuous Dorecene, and the patient Griselda on either The stove is an admirable specimen of workmanship.

TYPOGRAPHY AND MISCELLANEOUS STATIONERY.

E houses of Caslon, Besley, and Figgins, certainly contributed the best llustrations of type founding on the English side of the Exhibition. Messrs. Figgins proved incontestibly the truth of their type by the bition of a form of pearl, made up of two hundred thousand pieces, ported in the air by merely the lateral pressure of the screw-chase. e the type irregular this could not be effected. Their specimens of type for newspapers were very excellent, but their dissected type lds, machines, and raw material (antimony and lead) used in their ufacture, tell us very little about the process of type founding, which, ould wish had been practically exhibited as one of the most curious important branches of industry in the world. The old established house of Caslon and Co. had exhumed some of their long buried treasures, and showed the progress of type founding since the time of William Caslon (1720) up to 1851. Looking over these old specimens we were much struck by the beauty of the Roman letter, and inwardly remarked that our apparent progress, had not, in some instances, been a real advance. The script of Messrs. Caslon is, however, very beautiful. Messrs Robert Besley and Co., exhibited a highly polished type mould, and, what was far more interesting, specimens of Elizabethan type, with ornamental Tudor capitals, script



STAMPED LEATHER ORNAMENTS.—LEAKE.

Roman, Syriac, Persian and Arabic, together with borders adapted for colour-printing, all of which were good. Miller and Richards' modest frame, containing a specimen of the smallest type ever produced, and called "brilliant," was very interesting, as showing the perfection of the new type-casting machine patented by Mr. Richards. Our readers will estimate the minuteness of this type when we tell then that "Gray's Elegy," of thirty verses, occupies a space of only three inches and three quarters by three inches.

We confess that we do not take kindly to either Mr. Pitman's phonotypic, or Dr. Benner's phonological alphabets, and therefore leave their merits to the judgment of our readers. Mr. Pitman, we must however admit, deserves commendation for his great perseverance. There was an interesting selection of type in sixty-seven languages, from the founts of the celebrated James Watts, and exhibited by his son. We had likewise in this section good specimens of type from Fergusson, of Edinburgh; Stephenson, Blake, and Co., of Sheffield; also specimens of brass rules and type from Duncan, Sinclair, and Son; and music type by Novello and others. In stereotyping we had a large collection of casts from Messrs. Knight and Hawks. Specimens of a new process of bituminous polytyping, from Messrs. Manchin

and Morel, in which the printing surface itself is a bituminous compound. This process is ingenious, but has arrived too late in the field to compete successfully with the now rapid processes of electrotyping, the casts produced by which are far more durable and less liable to injury. In electrotyping we had but very few specimens. Messrs. Delarue and Co., who employ this art extensively, and who might have contributed very interesting casts, seem somehow to have overlooked the subject: this is to be regretted, as we had nothing to show in competition with the Austrian collection. We noticed some casts exhibited by J. Baker, made according to a method introduced recently into England, and which consists in casting fusible metal into lime-wood matrices, which are made in a peculiar manner. This is an art extensively employed in printing silks and other textile fabrics. Before quitting the type section we must notice the type and wood-cut printing of Messrs. Bradbury and Evans as a work of merit; likewise the polyglot bibles of Messrs. Bagster and Sons, which, our readers are doubtless aware, are printed in various languages, and correspond page for page, with each other. Nor must we omit to mention the extensive case of the British and Foreign Bible Society, with one hundred and sixty-five books in different languages, containing parts or the whole of the Holy Scriptures, nor the case of the Religious Tract Society close by its side, containing religious tracts in many languages. Also we had a case belonging to the London Society for Teaching the Blind to Read, containing embossed books, maps, geometrical tablets, and apparatus for writing; and similar contributions from other excellent charitable societies. Whilst turning from these, our eye lighted upon a box just at the entrance of the section, which we at first took to be a poor-box, but were informed that it was an invention of a working man for the distribution of postage stamps. The customer, on dropping in a penny, it is said, will receive a postage stamp; if only a half-penny, he must repeat the operation. We must not forget to notice Mr. Paxton's first rough sketch of the Great Exhibition building, which was interesting for its very roughness; and with a word for Mr. Tait's school outlines, which did not attract our attention until we overheard a young aspirant after knowledge declare that "they were capital things to teach a fellow to draw," we will proceed with the subject of type in the French section.

Here our eye first lighted on a mould, exhibited by Marcellan Le Grand, for casting one hundred and fifty types at one time, and with which it is asserted that a workman may cast forty thousand types in a day. M. Le Grand exhibited likewise specimens of types of the oriental languages, including Chinese. There was also a fine selection of type from C. La Boulaye and Co., the successors of the celebrated Firmin Didot and Co., quite worthy of the high reputation of this wonderful establishment. The German character is particularly beautiful. As for M. Derriery's musical type, it is so perfect, that it is difficult to believe in its being typography; his type borders for colour printing are likewise good. M. A. Curmer exhibited specimens of stereotyping from paper matrices—an art which was introduced into England a few years back, and abandoned. M. Gautier, ...'s brass type for bookbinding and other purposes, is the best of its kind. M. Dupont exhibited some specimens of litho-typography, produced from stones, etched so as to leave the printing surface in high relief, and types set up in fanciful forms which struck us as by no means remarkable. The best thing in his collection appeared to be the reprint, from lithographic transfers, of an old typographical work printed in 1786, entitled "Recueil des Historiens des Gaules et de France," and filling eight hundred and eighty-five pages folio. The books from the National printing-office, in Paris, we need scarcely say, were good specimens of typography.

Austria appears to stand pre-eminent in typography and the allied arts of stereotyping and electrotyping. We noticed particularly, amidst the varied ... of the Imperial printing-office of Vienna, a system of type for composing the eighty thousand signs of the Chinese language by means of about four hundred points and strokes; the composition appeared, however, to us to be a work requiring a great amount of care to avoid the chance of errors, which a slight alteration of the position of any one of the points would cause. The Lord's Prayer in two hundred and six varieties of language, and in the character peculiar to each country, is a remarkable production. Stereotype and electrotype casts of the size of royal paper, with the plaster matrix used for the first, and gutta-percha moulds for the latter, were amongst the riches enumerated in an explanatory pamphlet placed at the disposal of visitors. The specimens of lithographic printing were also of the greatest beauty. This collection was so vast and absorbing that we thought it was the only contribution of the kind from Austria, until we lighted on Haase and Sons' (of Prague) specimens of types and typography, which, although eclipsed by the larger collection, contained some things of merit.

The United States, the land of Franklin, as far as we could perceive, contained only one specimen of type, and that was not remarkable. We noticed in the Zollverein some excellent specimens of electrotypes from E. Haenel, of Berlin, matrices from wood blocks, brass types, and brass engraved rules, with specimens in chromotypography—the latter not remarkable.

We now return to the English side, to describe the miscellaneous stationery, fancy papers, playing cards, &c. &c. In this department the Messrs. Delarue and Co. were the largest exhibitors, their stall being literally crowded with specimens, novel in design. We were particularly pleased with two books, the one containing a large collection of linen ornaments of great chasteness, and the other a series of fancy papers; the uses of which are exemplified by the albums and boxes, to which we shall have occasion hereafter to advert. In these books the beautifully blended enamel coloured papers are so arranged as to contrast with each other, and are certainly the nea... approach to the representation of the prismatic spectrum of anything... have seen. The greatest novelty, however, was the iridescent papers, wh... chameleon-like, change their brilliant hues when viewed from differ... positions. They are produced by a thin film of colourless varnish, wh... is spread out upon water and then lifted off to the object to be cove... The application of this new art was exemplified by artificial shells... splendid as Nature's choicest productions—beetles that would deceive e... the microscopist—pearl-like visiting cards, and ornate bronzes. It app... incredible, at first, that a varnish, colourless in itself, should produce th... resplendent hues; but what schoolboy has not blown bubbles and adm... the beautiful tints which make their appearance, and which become m... and more vivid as the bubble becomes attenuated, till it bursts. It... exactly such a thin film as encloses the air bubble, but of a more perman... material, which produces these colours on paper. Sir Isaac New... discovered and investigated the colours produced by a film of air contai... between two lenses, and which are still called Newton's rings: and t... determined the numerical data on which the undulatory theory of ligh... based. In playing-cards the Messrs. Delarue and Co. surpassed everyth... else of the kind exhibited. The designs by Mr. Owen Jones are very eleg... especially those which were destined for her Majesty. It must be gratify... to the antiquarian to find that playing-cards, on which so many goo... volumes have been written, still maintain their influence on the art... engraving and printing, of which they were the cradle. We remai... likewise cards in which each suit is printed in a different colour, and w... struck us as likely to be of service to short-sighted persons. There ... similar cards on the French side of the section.

Mr. Whitaker likewise exhibited playing-cards, with ornate design... some merit. Messrs. Dobbs and Co.'s case contained specimens of embo... boards and lace paper; amongst them we perceived some of Raph... cartoons, "The healing of the lame man." Mr. Buck exhibited hand-scre... Mr. Kronheim, in addition to his print of "The Descent from the Cr... sent embossed and gilt labels, specimens of which were likewise exhib... by Mr. Mansell, who also displayed lace papers of good design, and s... gigantic valentines. Messrs. Dean, Messrs. Meek, and Mr. Hider, were ... contributors of valentines. We are quite at a loss for a standard of t... by which to judge this class of productions, but we suppose that they pl... the parties for whom they are intended, and certainly they display m... ingenuity in concealing many a little appropriate stanza beneath t... intricate foliated ornament. We know not whether valentines are use... Germany, but we found at Mr. Techner's stall, in the Prussian departm... specimens of the leafage used in their manufacture; and also at ... Schaenfeiler's (Wurtemburg) specimens of lace paper. Mr. Pinche's dis... of envelopes, with private crests, will sustain his name as an engraver; ... the envelopes with ornamental seals, by Smith, of Rathbone-place, ... likewise good, but struck us as specimens painted up for the occa... rather than objects for current sale. Near them we perceived some flori... letter paper, of Mr. Wildes, of Snodland, the design of which was give... the water, and is similar in character to those before mentioned. Th... were some ingenious envelopes of Mr. Dudman's, with moist cer... contained in a tin-foil capsule.

We now turn once more to the foreign side of the Exhibition. In ... French department, M. Marion, of Paris, exhibited fancy papers ... envelopes; but although they were all very beautiful, there appeare... have been no exertion on his part to produce novelty. M. Valant's fa... envelopes and papers, ornamented simply with ruled lines in colour ... metal, were very chaste. Lefevre's fancy letter and note papers deser... praise, and the playing cards exhibited by him were the only contribut... of the kind from France—they had the various suits printed in diffe... colours, the same as some exhibited by Messrs. Delarue. M. Ernest Me... exhibited specimens of chromo-typography applied to heraldic illustrati... which are very successful. In the Belgian department we noticed a sm... collection of envelopes in which we perceived some of a buff colour, ... which we were informed were for the American market; fancy wax, ... remarkable for its beauty, by Zegellaar; beautiful fancy marbled pa... were exhibited by Messrs. Glenisson and Vangenetchen; playing-cards w... exhibited by those gentlemen, and by M. Daneluy; these cards appea... to be of good quality, but not equal in finish to those manufactured ... England; and this remark applies generally to all the playing-cards exhib... by foreign makers. The Austrian playing-cards, are perhaps, the m... highly glazed of the foreign cards, and in other repects well manufactu... The exhibitor was J. Geirg Steiger, of Vienna. In Russia, we are inform... that the manufacture of playing-cards is a Government monopoly, the pro... being applied to the support of foundlings; but we did not see any specim... Denmark sent playing-cards of fair quality, manufactured at Copenhag... by M. Holmbald. Trommann, of Darmstadt (Zollverein), exhibited a la... collection of playing-cards, well manufactured, and amongst them ... recognised copies of English cards, we suppose for exportation to ... colonies. There were specimens of playing cards also from H. L. Schnap... of Offenbach; and altogether Germany may pride herself on her con... bution in this manufacture, as well as in fancy coloured papers. Ame... sent no playing cards, although we believe they are manufactured t... considerable extent, especially of the lower qualities.

O. Schafer and Schube, of Berlin, showed some good embossed boards a... chromo-metallic embossed borders. Theodore Von Zaber, of Mayen... exhibited specimens of chromo-typography, of which we cannot speak ... praise. The fancy marbled papers manufactured in Germany are rema...

beautiful; there were specimens exhibited by Wüst Brothers, of nstadt, and Allois Dessaur, of Aschaffenburg, Bavaria, who likewise bited good specimens of surface coloured embossed paper. M. Hamel's mens of fancy embossing and printing were pretty good. Lastly, aenle, of Munich, contributed by far the best specimens of imitation papers in the Exhibition, together with embossed gold ornaments.

MEMOIRS OF WORKING MEN.

JAMES WATT.

E celebrity of some men may be compared to a meteor which appears r a little and then vanishes away; their memory is only found in their lo monuments. Others, again, like planets, have succeeded in attain- more permanent distinction; they have conferred benefits upon their v men which remain after them; they require no busts—no empty ous structures to tell that they have lived; their memory is in their s. Of the latter class was JAMES WATT, the immortal discoverer of team-engine. He was born in 1736, at Greenock, in Scotland, where ther was a merchant and magistrate. His grandfather and uncle both guished themselves as mathematicians and engineers. The subject of nemoir was educated in his native town, which has long been dis- ished as a port of extensive commercial relations and for the elegance ubstantiality of the works of its mechanics, especially in reference to vation. Till the age of sixteen he continued at the grammar school, be was apprenticed to a mathematical instrument maker. At the age hteen he was sent to London, being bound to a distinguished mathe- al instrument maker. Here, however, the delicacy of his health, an attack of rheumatism, occasioned by working one winter's day in pen air, prevented him from deriving any advantage from his situation. e was soon obliged to return to his native country. In 1757 he went side in the University of Glasgow, being appointed philosophical instru- maker to that seminary, with apartments in the building. In this ion he remained till 1764, when he married his cousin, Miss Miller, en established himself in the town as an engineer. While in this ity, he was consulted with regard to the great canal which traverses nd from east to west, termed the Caledonian Canal; and he is said to projected the canal which unites the Clyde and Forth. An accidental nstance, however, had given a different bent to his pursuits. One of comen's steam-engines had been sent to him from the Natural sophy class for the purpose of being repaired, and this turned his tion to the power of steam, of which he was destined to make such did applications.

has been usually admitted that the first individual who ascertained ct that steam was capable of raising weights or water, was the Marquis orcester. M. Arago, however, in the *Annuaire* for 1837, denies the acy of this conclusion, and claims the discovery for Salomon de Caus, ntryman of his own. A few extracts in the words of the respective rs will enable the reader to draw his own inferences. Hiero, of ndria, 120 years before the Christian era, was acquainted with the fact steam, under certain circumstances, could give rise to motion. In Blasco de Garay, a sea captain, proposed to the Emperor Charles V., ake embarkations even when there was a perfect calm, and without nd oars. In June of the same year he is said to have made an iment with a vessel of 200 tons, which he carried into Barcelona, ding to some, at the rate of a league per hour; according to others at te of two leagues in three hours. The apparatus which he employed large cauldron of water attached to wheels connected with the sides e vessel. This account is given by M. Gonzalez, in Zach's astronomical spondence for 1826. It is altogether, however, so improbable that importance can be attached to it; such is the Spanish claim to the very of the force of vapour. In 1615, Salomon de Caus wrote a work ed "*Les Raisons des Forces Mouvantes, &c.*" In this he states that if be introduced into a copper globe, with a tube passing vertically gh the upper part of the globe, and dipping under the surface of the r, on the application of heat to the globe, the water will be driven up ibe; he observes, "the force of the vapour (produced by the action e) which causes the water to rise is produced from the said water, vapour will depart after the water shall have passed out with great " This is the French claim to the invention of the steam-engine. 29, Branca, of Rome, described the eolipyle, or vapour blow-pipe. however, has little connexion with the subject. In 1663, the uis of Worcester published his "Century of Inventions." In his sixty- h invention, he states that he has discovered an admirable and very rful method of raising water by the assistance of fire, not by aspiration, the philosophers say, *intra sphæram activitatis*, the aspiration acting at certain distances; "but my method has no limits if the vessel sses sufficient strength." He took a cannon, filled it to three fourths, hut up the open end; he then kept up a constant fire around it, and e course of twenty-four hours the cannon burst with a great noise. ing a way to make my vessels so that they are strengthened by the within them, and that they are filled in succession, I have seen water a continuous manner, as from a fountain, to the height of forty feet. sel full of water rarefied by the action of fire, raised forty vessels of water. The person who superintends this experiment has only two cocks to open, so that at the instant when one of the two vessels is ied, it is filled with cold water during the time that the other begins to act, and this in one direction. The fire is kept in a constant degree of activity by the same person, he has sufficient time for this during the intervals which remain after turning the stopcock." Such is the English claim to the discovery of the steam-engine. Whatever opinion may be arrived at, one thing is certain, that if his predecessors were ignorant of the force of vapour and its moving power, the Marquis of Worcester was quite familiar with them. In 1683 Sir Samuel Morland wrote his "Elevations of Water by all kinds of Machines," a manuscript preserved in the British Museum. He observes that "water being evaporated by the force of fire, its vapours require a much greater space (about 2000 times) than the water previously occupied, and rather than be confined will burst a piece of cannon. But being well regulated according to the rules of statics, and by science reduced to measure, to weight, and to balance, then they will carry their burdens peaceably (like good horses); and thus they will be of great use to the human race, particularly for raising water according to the following table, which expresses the number of pounds which may be raised 1800 times per hour to the height of six inches by cylinders half filled with water as well as the different diameters and depths of the said cylinders." In 1690, Denis Papin, a native of Blois, in France, first thought of placing a piston in a cylinder and acting upon it by the force of steam. It is unnecessary to enter into the question of the priority of the discovery of the steam engine from these preceding details, because they appear merely to demonstrate the force of steam, or its moving power—the alphabet of the steam engine.

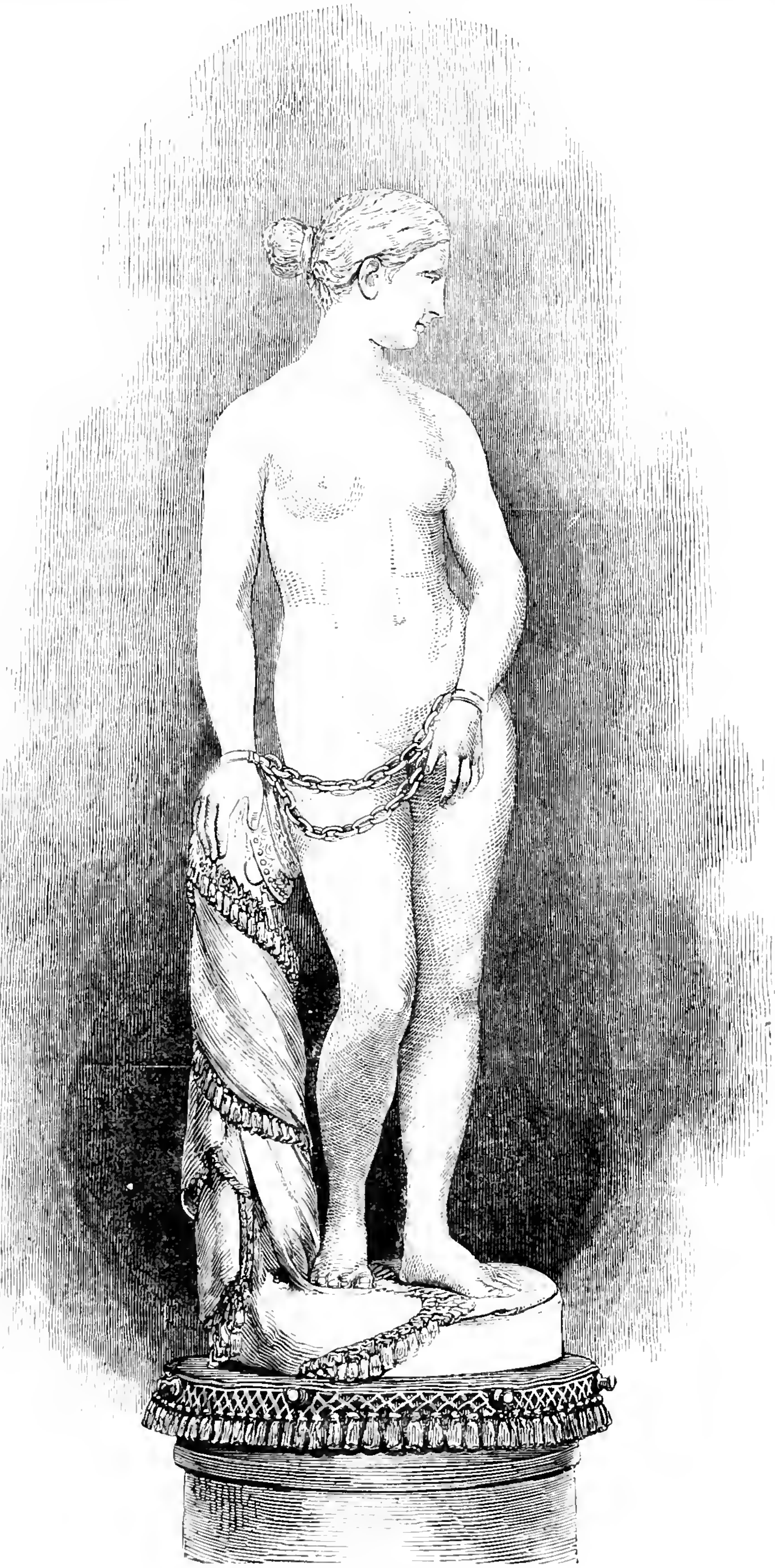
In 1698, Captain Savery obtained a patent for an instrument in which the power of steam was applied to practical purposes. The water was placed in a boiler, the steam escaped by a tube at the upper part of the boiler into a large spherical vessel, where, upon being condensed, a vacuum was formed, which enabled the atmosphere to act. It was therefore the atmosphere, and not the steam which was the moving power. In 1705, a patent was taken out for an improved engine on the same principle, in the names of Newcomen, Crawley, and Savery. It was in 1764 that James Watt was employed to repair a model of one of these engines belonging to the Natural Philosophy class in Glasgow college. He was struck with the defects of the machine, and set about improving it. In 1768 he completed his first engine, which, as with those now in use, differed from that of Newcomen by the condensation of the steam taking place in a second vessel, so that the descent of the piston was produced by the force of the steam, and not by atmospheric pressure; the ascent of the piston was also produced by the power of the steam. The engine of Watt was therefore a true steam engine; those which preceded it can only be considered as machines which produced certain effects by the atmosphere acting on a vacuum produced by the condensation of steam.

Dr. Roebuck supplied Watt with the means of accomplishing this great work, and in 1769 he obtained his first patent. Watt had remarked that two-thirds of the steam were condensed by the contact with cold water; hence there was a loss of two-thirds of the fuel. He first attempted to substitute a wooden pipe for a tube of iron, considering that the wood is a worse conductor of heat; but he found that the wood had less resistance to the sudden alternations of temperature. He then thought of passing the steam into an iron tube without cooling the walls of the tube; this constituted the invention of the condenser. This vessel, free from air, and communicating with the water, being opened at the moment when the tube is filled with steam, draws the latter towards it, and when the vessel receives at the same time a jet of cold water, the steam which is passing to fill it is condensed; the remaining part of the steam in the pipe is removed into the vacuum caused by condensation, and thus the piston is allowed free play. To get rid of the water in the condenser, a small air-pump was applied, which was worked by the piston. The invention of the condenser was then Watt's first great improvement. The second was the admission of steam above and below the piston according as it was to be depressed or raised. He surrounded the metal tubes with wood in order to keep in the heat. He calculated with precision the quantity of fuel necessary for producing a certain portion of steam and the volume of cold water required to condense it. Such were the inventions for which the new patent was obtained, but funds were wanted to extend the utility of the discovery. Fortunately, in 1776, Dr. Roebuck, who had exhausted his means, met with a purchaser of his interests in the patent in the person of Matthew Bolton, of Birmingham. To him, therefore, it may with justice be said that the country owes the present diffusion and importance of the steam-engine. The firm of Watt and Bolton commenced their manufactory at Birmingham by constructing a steam-engine, which all those interested in mining were requested to inspect The invention began gradually to be appreciated, especially in Cornwall, and Watt's engine very soon replaced that of Newcomen. One great encouragement to adopt the new engine was the terms upon which it was supplied. The agreement was, that one-third of the saving of fuel over the old engine should be the price of the new engine. The saving was carefully ascertained in this way: the quantity of fuel necessary for producing a certain number of strokes of the piston was ascertained by Newcomen's engine and by a new one of the same dimensions. The number of strokes was determined by means of a piece of clock-work, termed the *counter*, attached to the engine, and so arranged that every stroke advanced the hand one division. The instrument was placed in a box supplied with two keys, and was opened at the time for settling accounts in presence of the agent of Watt and Bolton, and of the director of the mine. To show the amount of saving it is only necessary to state that the sum which the firm derived from three engines in one year at the Chace-water Mine, in Cornwall, amounted to 2382*l.*,

proving that the saving of fuel by the new plan was equal to upwards of 7000*l.* per annum, being equivalent to 2382*l.* per annum on each engine.

The manufactory of Soho speedily extended its limits, and what was once a sterile hill, soon became a populous and fertile manufactory. The firm obtained an extension of their patent to 1800. To this period the engine had only been employed to raise water, but in 1800, Watt began to think of applying it to mills. This, he conceived, might be effected on the principle of the spinning-wheel, where the impulse which turns it one-half completes the revolution. While engaged with his models, he learned that a manufacturer of Birmingham, named Rickards, had constructed what he was in search of. He procured a plan of it, and found that it was precisely his own; he ascertained that his own plan had been sold by one of his faithless workmen to Rickards, who had procured a patent. It was too late to claim the invention, and he therefore sought for a new plan. He accordingly invented what is termed the sun and planet motion.

The intelligent and aspiring mind of Watt, however, was not content with directing its attention to one subject alone. He invented in 1779 a copying-press consisting of two cylinders, between which a sheet of moistened paper was passed and applied over a printed sheet; this contrivance was very successful. In March, 1787, he introduced into Great Britain the method of bleaching cotton by means of chlorine which had been discovered in France by Berthollet. This claim was at one time disputed in favour of Professor Copland, of Aberdeen, but it was quickly set at rest on the side of Mr. Watt (*Ann. of Phil.*, viii., 2). In 1800, Mr. Watt retired from the firm with a handsome fortune, and was succeeded by his son, who continued along with the son of Mr. Bolton to carry on the manufactory. During his residence in Glasgow his first wife died. At Birmingham he married the daughter of Mr. Macgregor, a manufacturer in Scotland, with whom, in the heart of his family, he happily spent the evening of his days. He was elected a fellow of the Royal Societies of London and Edinburgh, and the Institute of Paris in 1808 made him one of their eight foreign ass ciates. In 1817 he visited Scotland for the last time. In the course two years afterwar his health broke dow and he died on the 25 of Augnst, 1819, ag eighty-four years, b loved and respected all. Mr. Watt was o of the most extraor nary men of any ag He was not only mechanic, he was accomplished schol and yet in a great me sure self-taught. was familiar with t modern languages a had an excellent quaintance with c mistry, physics, an quities, architectu and music; in short, was generally well- formed. Possessing these requisites, and splendid benefactor his conntry, it is markable that gove ment never confer any honour upon hi Immersed in expens wars which delug foreign lands with blood of our fell creatures and impo rished our own peo it sought only to stow rewards on th who were foremost the fight. It was p haps well; the days these men are past, those of Watt will dure for ever. T visitor to the anci relics of Westmins Abbey may have ticed many a gorge monnment in mem of individnals who h left no record beh them save these he less stones, or a noti perhaps, in the hist of battles of their h ing assisted in the p mature death of so friend of freedom unfortnnate foe; looks long in vain the monnments of th who have succeeded advancing the pow of the mind, and at l espies an obscnre tab which tells that onl mere spot can be spar for the truly migh dead. The memory Watt was left to established in peace times, when a philo pher, the hero of int lect, is valued above hundred warriors, t heroes of the passion for Watt assisted snperseding the barl rism of war. A han some statue of W was erected in 1824. Birmingham. Glasg has a similar tribute his memory, and We minster Abbey can now boast of having deposited within its walls a mar statue of one who has conferred greater benefits on his country and the world than perhaps any individual commemorated by its monuments



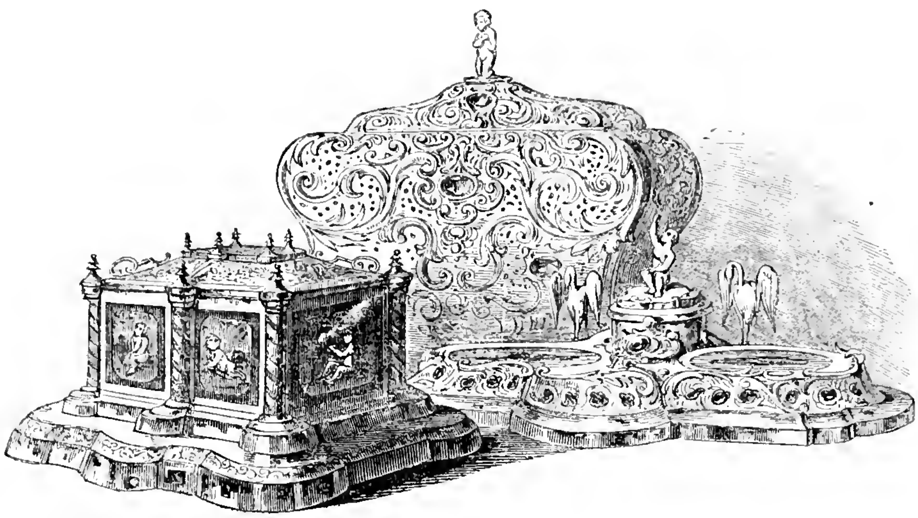
THE GREEK SLAVE.—HIRAM POWER.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

GROUP OF OBJECTS OF VERTU, BY WERTHEIMER.

THIS brilliant group comprises, first, an elegant casket, Louis Quatorze stylo, of or-molu with porphyry inlaid; second, a casket, or-molu, with six panels painted enamel upon porcelain, besides other similar enrichments on the lid; and third, an ink-stand and penholder of most elegant shape, also in or-molu and porcelain. Nothing of the kind can be conceived more *recherche* and tasteful than these objects, which stood in the left department of the main avenue.

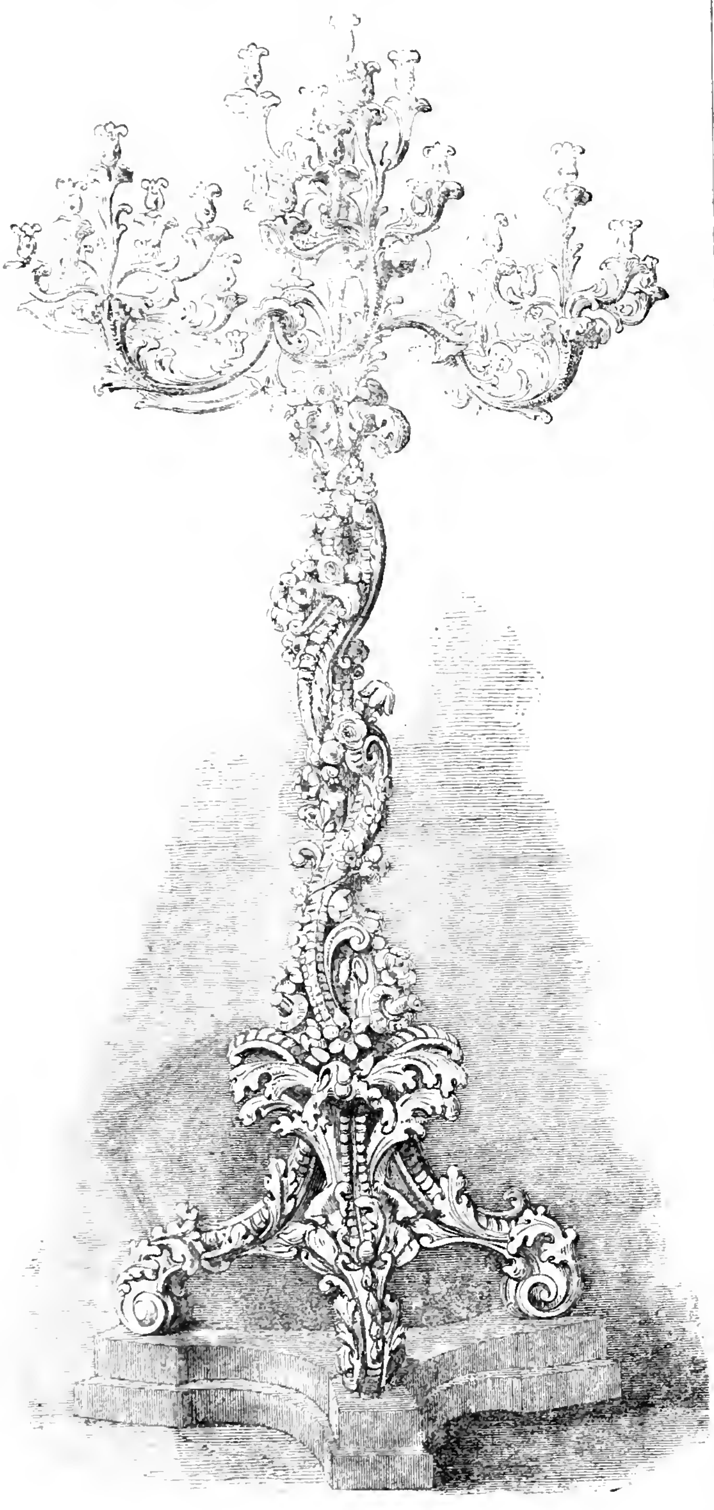


GROUP OF OBJECTS OF VERTU.—WERTHEIMER.

FURNITURE.—WEBB.

THE table exhibited with two chairs, by Webb, of Bond-street, claims to be Elizabethan, and of old workmanship, from its apparently free and careless handling; nevertheless, the carving of all the three articles is equally beautiful. The table is a very pretty, well-proportioned design, and is superior in every respect, but that of execution, to the chairs, which are left quite plain at the back, in the French fashion, but are too much loaded with projecting ornaments to be used with comfort. This is an error which sacrifices comfort to appearances; and which can never answer in the long run.

FURNITURE.—WEBB.



CANDLLABRUM.—BY MR. WEBB.

The candelabrum exhibited by Mr. Webb, of Bond-street, displayed great merit, both in design and execution; style, that of the Venetian of the sixteenth century. The carving is bold and effective, and the or-molu branches are well arranged and beautifully chiselled.

WARDROBE.—BY WILKINSON.

This wardrobe, in walnut tree wood and pollard oak, is remarkable for its good taste in the design, and simplicity in the ornamentation. It is not often we meet with a work so unexceptionably well finished, with so little attempt at meretricious display. (See p. 328.)

CRYSTALLISED SALTS.

AMONGST the various objects belonging to the Chemical Department, none were entitled to a larger share of attention than the various Crystallised Salts, so valuable in their application to manufacturing processes.

First amongst these we must mention the various large and very beautiful specimens of the hydrated double sulphates of alumina and potash, or ammonia, usually known by the name of common *alum*. This substance is sometimes discovered in a natural or native state; and where so found it occurs in volcanic districts in the form of a white flocculent powder, covering the surface of lava and other trachytic bodies abounding in such localities. In this form it occurs in Auvergne, in the south of France, in Sicily, and the volcanic islands on its northern coasts; but more particularly in the neighbourhood of Naples, in the Grotta di Alume on Capo Miseno, and in the Solfatara. From these localities it is collected, and dissolved in water, which, after being allowed to deposit the earthy impurities held in suspension, is evaporated, in order to crystallise the alum which it contains. The salt thus procured is subsequently purified by repeated crystallisations, and, when brought into the market, contains but a very minute amount of foreign matters. No fuel is used for the evaporation but the natural volcanic heat of the soil in which the leaden pans are imbedded.

The alum thus obtained forms, however, but a very small proportion of that which is annually employed in the arts; and much larger quantities are prepared in various localities by the chemical treatment of a mineral known by the name of alum-stone or alum-rock. This is a massive, granular, partially crystallised, transparent, and not homogeneous rock, which frequently encloses quartz, sometimes iron pyrites and manganese ore. This mineral, which is a basic sulphate of alumina united with sulphate of potash, is of a yellowish colour, sometimes passing into green or brown, and is not unfrequently found in the form of distinct crystals. The ordinary alum-rock, although less pure than the crystallised varieties, has a nearly similar composition, and occurs in considerable quantities, and in a massive state, at Tolfa, near Civita Vecchia, in the Papal States; at Montione, in the dukedom of Piombino; in the Comitats of Beregh and Zemplin, in Hungary; at Mont-d'Or, in France; and in somo of the islands of the Greek Archipelago.

Alum is prepared from this substance by first burning the stones in heaps or furnaces, and then transferring the residue to large walled cisterns where it is repeatedly moistened with water, and allowed to crumble for three or four months; at the expiration of which time it is converted into a soft mud, tasting perceptibly of alum, which is subsequently washed out with water and made to crystallise by the slow evaporation of the liquors. The alum so obtained possesses most of the properties of ordinary schist alum, which will presently be described, but it has also certain distinct characters, by which it may be distinguished from the latter salt.

The Roman alum always crystallises in opaque cubes, whereas the common variety assumes the form of transparent octahedrons. It also appears to contain a larger per-centage of alumina than enters into the composition of common alum; for although perfectly soluble in pure water a deposit of that earth is determined by heating the solution to about 110 degrees Fahrenheit. The salt thus obtained is, however, of peculiar value as a mordant for the purpose of fixing colours, and as such it is largely employed and much esteemed by the dyers of calico and other textile fabrics.

Originally the whole of the alum consumed in Europe was produced from alum-stone at Rocca, now called Edessa, in Syria—hence the name "roc alum"—and was brought from the Levant to this and other European countries. About the year 1460 the art of preparing alum was introduced at Tolfa by Johann de Castro, who first discovered the alum-stone in that district. The art spread from thence in various directions, and in the seventeenth century the manufacture of this substance was commenced both in this country and Germany, although the materials used and the processes of preparing the salt were very different from thoso previously employed for this purpose.

The greater portion of the alum at present consumed in the arts is made from alum shale, which is a kind of clay slate impregnated with sulphuret of iron and bituminous matters. This mineral is found in the Scandinavian peninsula, in Bohemia, in the Hartz, in Upper Bavaria, in Voigtland, in the mountainous districts of the Lower Rhine, near Whitby, in England, and at Hurlet and Campsie, near Glasgow.

When these schists are exposed to a high temperature, in contact with air, the iron pyrites (or bi-sulphuret of iron) which they contain loses just one-half of its sulphur, and is converted into the simple sulphuret of that metal; which, speedily absorbing oxygen from the atmosphere, becomes converted into sulphate of iron, or green vitriol. This sulphate gradually transfers its acid to the clay with which it is mixed, causing the production of sulphate of alumina and peroxide of iron. A portion of green vitriol however, remains undecomposed, and the quantity of this will be greater as the amount of the other salifiable bases contained in the schist becomes reduced. When lime or magnesia is present in the ore, they materially facilitate this decomposition, and afford corresponding amounts either of sulphate of lime or sulphate of magnesia, which latter salt is frequently one of the secondary products obtained during the manufacture of common alum from alum schist. The undecomposed portion of sulphate of iron is also washed out and crystallised, and forms an important item in the proceeds of an alum manufactory.

When the shale does not contain sufficient bituminous matter to rende

it combustible, it is piled in heaps with a proper mixture either of coal or wood; but, in most instances, it is found sufficient to place a layer of fuel at the bottom of the heaps only, as, when once fairly ignited, the combustion is carried on by the bituminous matters contained in the shale itself. At Whitby, these heaps are piled to the height of 90 or 100 feet, and form pyramids of which the sides of the base measure 200 feet in length. At Hurlet, on the contrary, the heaps are not built to above a few feet in height, but are extended over a considerably larger surface.

The lixiviation of the calcined ore is not usually commenced until the piles have become quite cold; but as from their great size the calcination requires many weeks, or even months, they are so arranged that any water which may fall on them in the form of rain, is conveyed by means of drains into proper reservoirs, where it is collected for subsequent concentration by evaporation. The cisterns in which the lixiviation is effected are commonly made of brick, and are so arranged on the side of a hill or sloping piece of ground as to allow of the contents of that which is higher in the series being drawn into that which is placed below it, in which case all the expenses which would be incurred to pump the liquor from one basin to another are entirely obviated. Into the highest range of cisterns the calcined mineral is now to be put—care being taken that the largest lumps are placed at the bottom, and afterwards drawn off into a lower cistern, and the partially exhausted ore again treated with a second supply of water, which, being much weaker than the other, is subsequently run into a separate cistern. When water is added a third time on the partially spent mineral, it is too weak for separate evaporation, and is preserved for the treatment of a fresh quantity of calcined ores.

The lixiviated mineral, after being exhausted of its soluble ingredients, is removed from the tank and piled up in a heap, where it may either be allowed to decompose spontaneously, or, when dry, is again subjected to calcination. The process of concentrating and evaporating these liquors is, from their liability when heated to deposit an earthy crust on the sides of the vessel in which they are contained, usually carried on by a surface heat in a long and narrow cistern of masonry, covered by an arched roof, which forms the flue of a fire-place situated at one end of the arrangement. During this operation a portion of the sulphate of iron present is occasionally separated, but the final elimination of this salt is effected at a later stage of the proceedings.

After being concentrated to a proper degree, the solution (which now contains sulphate of alumina and sulphate of iron, with frequently a greater or less amount of sulphate of magnesia) is treated with a proper quantity of either sulphate or muriate of ammonia, or sulphate or muriate of potash, either of which salts at once gives rise to the deposit of a copious powder, which is impure alum in the form of minute crystals. The mother liquors now contain sulphate of iron and sulphate of magnesia, which are separated from each other by repeated crystallisations; and the finely divided alum, which, from an admixture of the ferruginous liquors, has a reddish colour, is washed in very cold water, in which the iron salts are much more soluble than the alum.

After two successive washings, the alum is obtained as a perfectly pure granular powder; the first washing water, which contains a large proportion of the iron salts, is added to some of the other liquors, to undergo a second evaporation—whilst the second, which is more pure, serves instead of water for the first washing of the next batch of pulverulent alum. After the granular alum has by this means been thoroughly washed, it is placed in a large leaden pan, in which it is either dissolved by the action of a current of steam or by the smallest quantity of boiling water which will hold it in solution.

As soon as a concentrated solution of the salt is prepared, it is run off to large tubs called roaching casks, where it is obtained in the crystalline state in which it is sent into the market. These casks are smaller at the upper end than at the lower, and are made of very strong staves, nicely fitted together, and held in their places by heavy truss-hoops, which admit of being readily removed. The concentrated solution, during its slow cooling in these large vessels, forms large and regular crystals, which hang down from the top and project from the sides, whilst a thick coating of it is also deposited on the bottom of each tub. At the end of from eight to ten days the hoops are knocked off, and the staves constituting the sides of the vessel are separately removed, when an exact cast of the inside of the cask will be found modelled in white and perfectly pure alum. The workman now pierces one of the sides near the bottom with a pick-axe, and allows the mother liquor from the inside to run off upon the floor, from whence it flows into proper cisterns sunk in the ground, where it is collected for the purpose of being treated for the various salts which it may contain. The alum is now broken down into lumps of a convenient size, and after being properly dried, is stored in the finishing bing, and is ready for the market.

The mother liquor, besides containing ordinary alum, is composed of a saturated solution of the per-sulphate and proto-sulphate of iron, of chlorides of iron, sulphate of magnesia, and sulphates of the alkalies, besides which it contains soda-alum in solution, when soap-boiler's waste has been employed as the precipitant.

At Whitby, 130 tons of schist are required to make one ton of alum; but at Hurlet and Campsie, where the ore is of better quality, 50 tons only are necessary to make the same amount of salt.

Among the specimens of these substances exhibited were some magnificent crystals of alum and sulphate of iron, manufactured by the trustees of the late Mr. Buckley, of Manchester, on whose table were also examples of the alum-schist, both in its raw and calcined states, and likewise samples illustrating the various stages of manufacture of these most important products.

In illustration of the manufacture of alums, as carried on at Whitby, was a case belonging to Mr. W. Moberly, of the Mulgrave Works, near Sandsend, which contained specimens of raw and calcined alum-shale, alum-meal, and finished alum, together with sulphate of magnesia, both in its rough and finished states.

Similar specimens were also exhibited by the Hurlet and Campsie Alum Company, and products in illustration of the manufacture of green vitriol were forwarded by Mr. J. Hall, of Queenborough, in the Isle of Sheppy, where the substance is extensively produced. Mr. P. Spence, of Manchester, likewise exhibited some fine blocks of alum, and beautiful crystals of green vitriol, obtained by his new and improved processes for the production of these articles. In the year 1845, this gentleman patented the manufacture of alum from the common shale of the coal and iron formation of this country, which often lies in immense heaps in the neighbourhood of our collieries, and is usually considered as being of no commercial value. By this process, which is said to be both simple and effective, a ton of alum is obtained from every ton of calcined schist; and the specimens exhibited, which are of the kind known by the name of ammonia alum, are prepared by the addition of refuse liquors from gas-houses to the solution obtained by the lixiviation of the calcined stone. By the process of Mr. Spence, the pyrites are burnt in a kiln connected with an ordinary sulphuric acid chamber; and of the vitriol thus produced about one-half is added, with proper precautions, to the burnt pyrites remaining in the oven. By this method the whole of the pyrites are converted into sulphate of iron, and at the same time a considerable quantity of available sulphuric acid is obtained, at no other cost than the first expense of the apparatus employed. Mr. Spence also exhibited a slab made of a peculiar hydraulic cement prepared from the waste products of the manufacture of alum. This is obtained by mixing the calcined ore, after it is entirely exhausted of its soluble salts, with a certain proportion of the refuse lime which has been used for the purification of gas; these are then calcined together, and, after grinding in the usual way, are found to afford a cement having all the properties of hydraulic mortar. This discovery appears to us to be one of considerable importance, and likely to afford many practical advantages.

The purposes to which alum is applied, and the various arts in which it is more or less extensively employed, are far too numerous to be particularly mentioned; but among its more important uses may be cited its application as a mordant, and as a base in the preparation of many of the finer colours, such as the lakes and carmines. It is also extensively used in medicine as a valuable astringent; and it is largely employed for the manufacture of the glossy white substance called satin white, which is laid on the surface of many kinds of ornamental papers, for the purpose of giving them a firm body and a smooth surface.

Copperas, or green vitriol, is of most extensive application in many branches of the arts of every-day life. It enters largely into the composition of the ink with which we write—forms an essential ingredient of blacking and of many black dyes—is the salt of iron employed in the manufacture of Prussian and Chinese blues, for staining black leather—is used in medicine as a styptic—and is of extensive application in a vast number of other ways, which our space will not allow us to notice at present.

In connexion with this substance, we noticed some very beautiful specimens of alum and sulphate of alumina, exhibited by Mr. H. L. Pattinson, of Gateshead, Newcastle-upon-Tyne. Sulphate of alumina is commonly known in commerce as concentrated alum, and is made by treating with sulphuric acid clays rich in alumina, and subsequently throwing down, in the form of Prussian blue, the iron which they contain, by the addition of yellow prussiate of potash. This substance, except in not being crystallisable, possesses all the characteristics of common alum in a higher degree than that salt itself, and it is daily becoming more extensively employed among dyers and calico-printers, to whom, from its large per-centage of alumina and its perfect solubility, it has become a most important acquisition.

MODEL OF BRIEN BOROIMHE'S HARP.—EXHIBITED BY MR. BALL, OF DUBLIN.

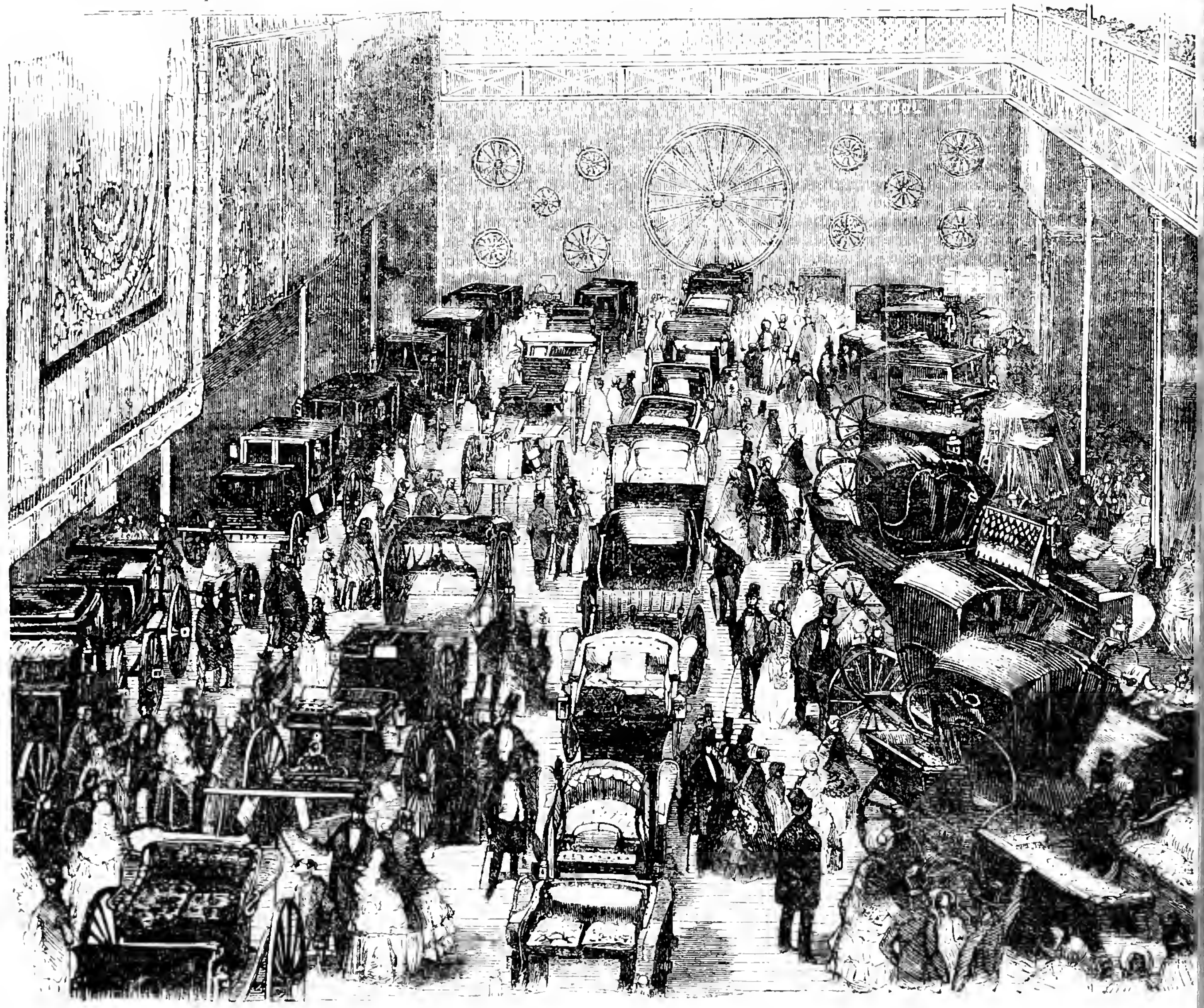
THIS little subject will be viewed with interest, as a correct counterpart of the ancient Celtic harp. It is described as a model, being a restoration of the ancient harp commonly called the harp of Brian Boroimhe, (Brien Boru), King of Ireland, preserved in the University Museum, Dublin. This restoration is made in the hope of inducing artists to adopt it as a model in emblematic devices relating to Ireland. It is certainly the oldest existing Irish harp: and is supposed to have been figured on the coins of Henry VIII., and in the mutilated state in which it long remained, it gave origin to the curt and inelegant form not unfrequently used in jewellery, &c. It is now restored to the graceful form it originally possessed, and its elaborate carving has been carefully and accurately restored. (See p. 328.)

ALHAMBRA STOVE.—BY STUART AND SMITH, SHEFFIELD.

THIS is one of the very handsome stoves manufactured by Messrs. Stuart and Smith, of Sheffield, which we particularly commended in a previous notice. The pattern is arabesque of the richest description, in or-molu and bright steel. It was purchased out of the Exhibition by Her Majesty. (See p. 328.)

CARRIAGE DEPARTMENT.

MAN has been variously described as a cooking animal, as a laughing animal, a trading animal, and by no end of other attributes, as the culinary, risible, commercial, or other feelings of the describer predominated; but, as we walked through the compartment of the Crystal Palace devoted to carriages, cabs, locomotive engines, and other means of conveyance, we could not help thinking that he might be quite as appropriately distinguished from the brute creation by the definition of a coach-building animal. Nor was this opinion weakened on our way home through



CARRIAGE DEPARTMENT.

Piccadilly, crowded with cabs, omnibuses, and every description of vehicle, conveying hundreds of passengers, here, there, and everywhere.

From the days of the charioteer Jehu, who, we are told in Scripture, "drove furiously;" from the days of the old Assyrians, Ninevites, and Babylonians, of whom we have the sculptured representations as they appeared in their chariots of war; from the days of the Olympic chariot races; from the days of the ancient Britons, who, Cæsar tells us, garnished their coach-wheels with scythes, down to the present time, when fast men drive about in Hansom cabs; when hard-worked mechanics take a shilling trip by railway into the green fields; and when even the poorest occasionally indulge in a threepenny omnibus to Camden-Town, or other suburban retreats—we have continued evidence of other means of locomotion than the two legs with which nature has endowed us.

Yet, notwithstanding this antiquity of the practice of riding in carriages, coach-building, as we now understand it, is of but comparatively recent date in England, being no further back than the reign of Elizabeth.

Stow tells us, that, "In the yeere 1564, Guylliam Boonen, a Dutchman, became the Queene's coachmanne, and *was the first* that brought the use of coaches into England; and, after a while, divers great ladies, with as great a jealousie of the Queene's displeasure, made them coaches, and rid up and down the countries, to the great admiration of all beholders; and then, by little and little, they grew usual among the nobilitie and others of sort; and within twenty yeeres became a great trade of coach-making."

Anderson, in his "History of Commerce," makes the use of coaches in England even later than this, and says they were introduced by the Earl of Arundel about the year 1580. For a long time they were exclusively confined to the wealthy classes; and it was not till the year 1625 that coaches were let for hire, when they stood at the principal inns in London. In 1637 there were in London and Westminster only fifty hackne coaches.

From coaches let for hire, the next step in England was the introductic of stage-coaches, which very soon after 1638 were established. These, th immediate precursors of the omnibus for short distances, and railway fo longer ones, bring us down to our own day. Of mail-coaches, the first ra between London and Edinburgh about the year 1785; and the next, fro London to Glasgow, in 1788; from which time, spite of the intricate retic lation of railways, which now like a cobweb covers the map of Englan with its thousand branches, they have continued down to this day; and many a country village may still be seen the round red face of the coac man, as he pulls up at the door of the little roadside inn—still may b seen the bustling ostler, as he releases the smoking team from their harnes to give place (as has the system of which they are a type) to fresher, strong cattle—still may be heard the guard's official note as he winds his horn starting—vestiges, though they be of an age, which, though all but o own, has been miraculously hurried into the past by the omnipotent pow of the steam-engine.

From the sedan-chair and the cumbrous barge of the days of Elizabeth—luxuries that none but the higher classes could indulge in—to the excursion train and the penny boat of our own, how great a change! How great a change, too, from the heavy, lumbering vehicle which Guylliam Boonen constructed for his Royal mistress, to the light, the graceful, and commodious vehicles we saw exhibited in the Crystal Palace!

The contributions of our carriage-builders to the Exhibition maintained the superiority which they have long held in this department of manufacture.

Amongst the carriages exhibited, there were none absolutely new; but the special requirements of almost every one were here provided for. Approaching the style of a state carriage, was the "Semi-circular Clarence," built by Offord for the Exhibition; in which the axletree is so constructed, that if it should break, the wheels would continue to run without coming off; the springs are made on a plan to procure the ease of a long spring without its unshapely form; and a new self-acting door-lock fastens itself, and prevents the door from rattling. The hammer-cloth of blue silk velvet, decorated with gold and silver, is stated to be unique in design; but seems better adapted to be the carriage of an ambassador, or other important official personage, than that of a private individual.

Among the carriages of more utility, in which ease and convenience are especially attended to, was a Patent Brougham, with inverted double C springs, from the manufactory of Cook and Co. The old-fashioned C springs, from which carriages were generally hung, give a much more easy motion than the elliptical springs that have in a great measure superseded them. The suspension of a carriage from curved springs is a very effectual means of preventing jolting, though it is liable to produce a swinging motion; but the principal objection to them is their appearance. In the carriages fitted with the double C springs, this objection has been removed; for the double curve affords sufficient elasticity within a much shorter space and they are arranged underneath the carriage in the same position as, and looking scarcely more prominent than, elliptical springs. In the patent carriage of Cook and Co., fitted with these springs, there is also a convenient arrangement inside to serve as a substitute for the carriage baskets, which occupy so much room in front. Without impairing the external appearance, there is a cupboard made inside the coachman's seat, which opens inside the carriage.

A Carriage with Patent Automatic Invisible Steps, invented and exhibited by D. Davies, of Wigmore-street, dispenses with the attendance of a footman to open and shut the door. The steps act on the principle of the "lazy tongs:" they open with the door, and, as the door closes, they fold up underneath very compactly. There was also shown a Simultaneous Double Step; by a small connecting-rod, both treads opening and shutting at once, and more conveniently than in the ordinary double step; it can be opened or shut by a person inside the carriage, and can be made to work with the door.

An economical arrangement for those who desire to have different kinds of carriages combined in one, was shown by Rock and Son, of Hastings, the inventors of the Patent Dioropha, which may be used either as a Clarence, as a barouche, or as an entirely open carriage; if a covered one be wanted,

SIDEBOARD.—GUTTA PERCHA COMPANY.

either entirely closed or not, the appropriate head is fixed on. The folding-steps are likewise on a new principle.

Kesterton's Amempton Carriage is also of this class: which, by a simple contrivance, can be converted into a light, open, step-piece Barouche. The framework is secured to the head with a new kind of fastening; and the back, instead of being flat, is of a curved form.

A Four-wheeled Model Carriage was exhibited by the designer, G. H. Baskcomb, of Chislehurst. It indicates the distance of the ground travelled over, and marks the same upon a dial; it has spiral springs beneath the

driving-box seat: an elastic bar to relieve the feet from vibration: four preventive wheels, in case of accident: two arms with roller wheels, to protect the vehicle from collision; and a screw-break, by which the driver acts upon the wheels, so as to ease the vehicle down-hill, or stop it.

In Horne's Patent Segmental Brougham and Chariot, the distance between the wheels is greatly shortened by the application of the eccentric double perch bolt-lock in the turning of the fore-carriage.

A New Four-wheeled Carriage, or Improved Brougham, by H. Mulliner, of Leamington, has two distinct curves instead of one in the front part, and trimming inside at the back. In the communication with the coachman, the voice-conductor is entirely concealed; and the mouth-piece is at each side, instead of at the middle of the back, as usual, and suspended from the roof.

By Willoughby's Carriage invalids with fractured limbs, or severely afflicted, may be removed from their beds, without change of position or fatigue. Inside is a kind of platform, supported from the top by springs, which passes under the front of the carriage, and is long enough to hold a person in a recumbent position. A portable couch which fits on to this platform may be carried into the bed-room, and the invalid having lain down upon it may, without the slightest change of position, be introduced completely into the carriage through an opening at the back. Room is left on the side of the couch for two seats to hold attendants.

Of invalid or Bath chairs, to be drawn by hand, there were many kinds. One, manufactured by Jordan, had a self-adjusting reclining apparatus, an addition to the usual construction; and another, called a Park Wheel-chair, invented by Heath, of Bath, was decorated with paintings and glass panels.

There were among the carriages several varieties of Jaunting-cars, Dog-carts, and other light vehicles; some of which were constructed with remarkable paucity of materials, and were elevated by high wheels, so as to run over the ground with scarcely any perceptible draught.

Among the models of public carriages was a Cabriolet, to carry five persons in separate compartments; and an Omnibus divided into compartments; both patented by J. A. Franklinski: the omnibus has an outside gallery, with a separate door to each compartment, and an improved method of reaching the roof by end steps; and the entire carriage is 2 cwt. lighter than those in general use. A large omnibus, manufactured by Kinross, of Stirling, was also shown: it will carry 19 passengers inside, has a large ventilating well in the roof; the passengers, when going out and in, can walk upright; and the well forms a comfortable seat for outside passengers. It has double hind-springs, so that when lightly loaded, the motion is easy; and, when heavily loaded, both springs come into action, and cause it to retain the same motion: it is adapted for two or three horses abreast, with equalising bars or levers; as is also the Omnibus exhibited by Menzies, of Glasgow. Rock and Gowar, of Hastings, exhibited their Patent Omnibus, in which each passenger has apportioned his proper share of space on the seat, namely, 16 inches: the front and hind are circular, and the door opens both ways, so that passengers may get upon the step from either side of the road with safety.

There was also shown an Improved "Hansom" Cab, in which the driver is brought down from his elevated perch behind the hood, and the wheels are of lighter make. The body, too, is brought nearer to the ground and rendered more accessible, but the main features of the old style are preserved; and no attempt has been made to secure a registration of distances. Shillibeer exhibited two of his Patent Funeral Carriages, in which were combined the hearse and mourning-coach in one vehicle.

D. Mitchell, of Whitburn, Linlithgowshire, exhibited his model of a Safety Carriage, which, in peril, can be stopped from the inside with facility and safety; this invention was described in fifty different languages.

Of improved Carriage Construction, several specimens were exhibited; including working models of Collinge's Patent Axle-trees, besides their Spherical Hinges and Fastenings; Crosskill's Improved Patent Wheel, in which the spoke is turned with strong double-shouldered ends, the rims are turned, and double-shouldered sockets bored in the felloes—the hoop-tire being made and affixed by patent steam machinery.

Aitken's Patent Iron Wheels are stated to have nearly one-third less draught than any now in use, and from their suspending construction, to obviate all jar: and, in case of accident, a spoke of the wheel can be replaced in ten minutes without removing the tire.

In Lee's Patent, when the axle breaks, the wheels bear up, and continue the work of the carriage, without the axle; and they do not take fire, as the boxes carry oil to last twelve months.

There was also shown a model of Grisdale's Spring Carriage-wheels, in which the springs are inclosed in the nave of each wheel, and revolve with them: and any shock, from the uneven road, is received on the springs alternately.

Mr. Gibson, of Birmingham, exhibited his Elliptic Springs, between which is placed a block of India-rubber, the three thicknesses being bolted together, (with sufficient play,) and covered with a brass-box.

Among the Coach-furniture, that of Worcester china was generally admired; and much of the coach-lace was in excellent taste.

STOVE.—BY ROBERTSON, CARR, AND CO.

THIS is a very handsome stove—simple, but effective in style, and of admirable workmanship, by Robertson, Carr, and Co., of Sheffield. The upper part is of cast iron, the grate of polished iron or steel. (See p. 329.)

FOREIGN AND COLONIAL DEPARTMENTS.

BRITISH GUIANA.

THE space devoted to the productions of this colony was upon a portion of the south side of Canada; the most striking feature in connexion with them being the large proportion which raw materials and produce bore to the other articles exhibited. The colony, situated on the coast of the South American continent, and adjoining Brazil upon the north, produces nearly every article grown in the tropics, and in the richness and beauty of its timber it rivals many of the productions of its southern neighbour.

In the mineral kingdom the articles exhibited were principally specimens of sand, which are well adapted for the purpose of glass making, and of which considerable quantities are exported to the United States. There were also some interesting specimens of clays, obtained, at various depths, from an artesian boring of 125 feet.

The vegetable kingdom included specimens of rice, for the cultivation of which the colony is exceedingly favourable—so much so, indeed, that three crops, it is stated, may be obtained from one sowing, the second and third crops being derived from the old roots after each reaping. Some fine specimens of Indian maize, grown on the banks of the river Demerary, were exhibited. A large portion of the maize grown in the colony commands a higher price in the market than that imported from the United States, both the soil and climate being particularly adapted to its growth. We had, next, specimens of plantain and plantain meal. The plantain is used to a great extent among the natives as an article of food when in its green or unripe state. When boiled whole, the fruit form a tolerably dense mass, of greater consistency and toughness than the potato, and when beaten in a mortar it constitutes what is known as th *foo foo* of the negroes. The plaintain meal is prepared by the natives by drying it in the sun and then reducing it to a powder. It has a fragran odour, acquired in drying, somewhat resembling fresh hay or tea, and i largely employed as the food of infants and invalids. As food for childre and convalescents, it would probably be much esteemed in Europe, an it deserves a trial on account of its fragrance, and its being exceedingl easy of digestion. In respect of nutritiveness, it deserves a preferenc over all the pure starches, on account of the proteine compounds it con tains. Were the plantain meal to come into use in England, and to bea a price in any way approaching to that of Bermuda arrowroot, it woul become an extensive and very profitable colonial export. From 20 t 25 per cent. of meal is obtained from the plantain; or 5 lbs. from a average bunch of 25 lbs.; and an acre of plantain walk of average qualit producing during the year 450 such bunches, would yield a ton and 10 lb of meal, which, at the price of arrowroot, namely, 1*s.* per lb., would b a gross return of 112*l.* 10*s.* per acre. A new plantain walk would giv twice as much. Even supposing the meal not to command over half th price of arrowroot, it would still form an excellent outlet for plantai whenever, from any cause, the price in the colony sank unusually lo Specimens have been transmitted from the colonial laboratory to some the principal authorities on dietetics in England.

Another description of meal is that obtained from the bitter cassav Speaking of this product, Dr. Shier states, that "the roots might be use as an article from which to prepare cassava meal, *casareep*, and the ver small quantity of starch which is expressed along with the juice, leaving a the rest of the starch to form part of the meal. It is of such meal that th cassava cakes of the Indians are prepared, and although by no means nutritive as Indian corn-meal, there can be little doubt that in the Scot and Irish markets the cassava meal would obtain a preference; and wer it exported in quantity it would probably come into extensive use amon all classes."

The following is the amount of nitrogen and proteine compounds con tained in the cassava, the plantain, and the maize meal, as shown upo analysis:—

	Nitrogen. Per cent.	Proteine Compounds. Per cent.
Maize-meal (unhusked)	1·73	10·72
Plantain-meal	·88	5·45
Cassava-meal (juice expressed)	·36	2·23
Ditto from the sliced and dried roots	·78	4·83

The cultivation of the cassava, according to Dr. Shier, would be e ceedingly remunerative. He says—"If an acre of well-tilled, thoroug drained land yield 10 tons of fresh roots—and I have every reason believe that such a return might be obtained—I have ascertained th the produce would be $3\frac{1}{2}$ tons of meal, 593 lbs., of casareep, and 2 cw of starch: and estimating the meal at 1*d.* per lb., the casareep at 1*s.* 5 per lb., and the starch at 40*s.* per cwt., the gross amount would 78*l.* 13*s.* 4*d.* per acre. In ascertaining these proportions very simp machinery was employed, and had the pulp been better pressed t quantity of casareep would have been considerably greater. But cassa might be sliced, dried in the sun, and sent to Europe in that state. this case it would be the sweet variety that would be employed. In d weather the process succeeds remarkably well, and the dried slices ke well. I have ascertained that when these sliced and dried roots are fir steeped and then boiled, they return to very nearly their original con tion, and make an excellent substitute for the potato."

Although the banana is not very extensively cultivated in British Guiana, still several specimens were forwarded with the view of ascertaining how they would stand the voyage, and the probability which there would be of their becoming an article of export to this country. The specimens sent had been dried without the aid of fire; and although not so delicious as in their ripe state in the tropics, they were still exceedingly palatable. The banana yields fruit very shortly after the suckers have been planted. In eight or nine months the banana begins to form its clusters: and the fruit may be collected in the tenth or eleventh month. When the stock is cut, the fruit of which has ripened, a sprout is put forth, which again bears fruit in three months. The whole labour of cultivation which is required for a plantation of bananas is to cut the stalks laden with the ripe fruit, and to give the plants a slight nourishment once or twice a year by digging round the roots. A spot of little more than a thousand square feet will contain from thirty to forty banana plants. A cluster of bananas produced on a single plant often contains from one hundred and sixty to one hundred and eighty fruits, and weighs from seventy to eighty pounds. But reckoning the weight of a cluster only at forty pounds, such a plantation would produce more than four thousand pounds of nutritive substance. Humboldt calculates that, as thirty-three pounds of wheat and ninety-nine pounds of potatoes require the same space as that in which four thousand pounds of bananas are grown, the produce of bananas is consequently to that of wheat as 133 to 1, and to that of potatoes as 44 to 1. This fruit is a very sugary substance; and in warm countries the natives find such food not only satisfying for the moment, but permanently nutritive. Yet, weight for weight, the nutritive matter cannot at all be compared with that of wheat, or even of potatoes. At the same time, a much greater number of individuals may be supported upon the produce of a piece of ground planted with bananas, compared with a piece of the same size sown with wheat. Humboldt estimates the proportion as 25 to 1; and he illustrates the fact by remarking, that a European newly arrived in the torrid zone is struck with nothing so much as the extreme smallness of the spots under cultivation round a cabin which contains a numerous family of Indians.

Passing on from the edibles of the colony, we were next shown specimens of the coffee-berry, contributed by one or two of the estates which still continue to cultivate that plant. Owing to various causes, the cultivation of coffee is now almost extinct in this colony. Formerly it produced large quantities, the quantity returned for taxation in 1842 amounting to not less than 1,214,010lbs. Dutch. Some specimens of cocoa were sent: but, although the climate is well adapted for the growth of the nut, its cultivation is exceedingly limited. There was also a very curious production of the colony, known as the monkey pot—a very singular seed vessel, which contains a large number of oleaginous kernels, larger than almonds, and which are highly esteemed among the natives. Capsicums of various kinds figured in the collection, which were sent over with the expectation of their being found to be a more piquant condiment than the article sold under the name of Cayenne pepper. We next observed some jars of casareep, an article which is much used as the basis of sauces. It is the concentrated juice of the cassava; one of its most remarkable properties being its high antiseptic power, preserving meat or any other article of food boiled in it for a longer period than can be done by any other culinary process.

Several specimens of starch were shown, as also of Muscovado and vacuum pan sugars and molasses; the sugars being the produce of the Otaheite or Tahiti cane, the variety generally cultivated in the colony.

The materials exhibited as employed in the chemical arts or in medicines included various specimens of karman, used by the Indians for waxing their nets; milk from the cow tree; and hyawa gum or incense, a very fragrant substance, suitable for pastiles and similar purposes. Some remarkably fine laurel and crab oil—the former used by the natives in affections of the joints, the latter as a hair oil—as well as various dyes, pigments, and tanning substances, were exhibited.

Some of the samples of cotton were remarkably fine, and worthy of notice on account of their great freedom from seed, dirt, and impurities. Cotton has only been cultivated in the colony by the natives of the coast regions, but its cultivation is now in a great measure abandoned, the cultivators not being able to stand against the formidable rivalry of the United States. Sir Robert Schomburghk, in his description of British Guiana, states that "if, with regard to the abundance and cheapness of labour, British Guiana were put on the same footing as the slave states in America, an inexhaustible supply of cotton of every description might be produced. There is no doubt that all kinds of cotton, from the best long staple down to the finest short staple, might be cultivated in the colony, as the kind which does not thrive on one soil or climate might be produced in another. An extent of sea coast of two hundred and eighty miles from the river Corentyne to the mouth of the Orinoko, would produce cotton vieing with the best in the world. I doubt the opinion that the finest cotton will not grow at a greater distance than twenty miles from the sea. I have sent samples of the wild cotton from the interior of the colony which were admired by competent judges for their fine long staple and silky appearance. No care whatever had been bestowed upon the cultivation of these plants, which grew at a distance of three or four hundred miles from the coast. Although the growth of the plant was not luxuriant, it was covered abundantly with cotton of the most excellent quality; indeed, it would be highly advisable for the cotton-growers at the coast to exchange the seeds."

In addition to cotton, there were shown specimens of silk-cotton, exported to the United States and used in the manufacture of hats. It is a remarkably soft and glossy material, and well adapted for that purpose. The plantain fibre is an article which we believe might be profitably employed in manufactures in this country. It is produced from the stem of plantain and banana trees, and might be obtained in very large quantities from the plantain cultivation of the colony. It is calculated that upwards of 600lbs. weight of the fibre might be produced annually from each acre of plantains, after reaping the fruit crop. At present, the stem of the plantain trees, when cut down, are allowed to rot on the ground. If a remunerative price could be realised for this fibre, a new branch of industry would be opened up to the colonies. A barrel of the fibre contributed was sent for experimental purposes. It may be proper to mention that, in 1846, a gentleman visited the colony, and exhibited several specimens of cloth of a beautiful silky texture, and specimens of a paper of superior quality, manufactured from the fibre of plantains grown in the Jardin des Plantes.

The specimens of woods were remarkably fine, and a table-top made in the colony, of eighty different kinds of wood, was sufficient to prove that it possesses many kinds of wood highly ornamental, and which might be made exceedingly useful for cabinet-making and upholstery; while various other transverse and longitudinal specimens were admirably adapted for building and naval purposes.

The manufactures of the colony were represented by hammocks, ropes, Indian head-dresses, fishing-nets, baskets, the entire wardrobe of a female Indian, Indian war clubs, and the famous blow-pipe and quiver with poisoned arrows, a canoe and paddles, calabashes, some very curious wooden door-locks, and the model of an Indian house with the whole of the domestic establishment.

We likewise noticed diagrams indicating the temperature of the climate of the colony during the years 1846-1850, as noted at the George Town Observatory. Mr. Ridgeway, who was appointed the agent and representative of the interests of the colony decorated the Exhibition with a series of interesting lithographic drawings from the beautiful work of Sir Robert Schomburghk, which conveyed to the visitors a good idea of the natural scenery of the interior of the colony.

ILLUSTRATIONS IN THE PRESENT SHEET.

STAND AND CASKET.—BY WERTHEIMER.

This exquisitely wrought work of art, engraved in the next page, is of the most *recherche* character, being inlaid with malachite, which harmonises perfectly with the rich or-molu of which the casket is composed. The outline is very beautiful. The enrichments extremely varied, and fine in workmanship. The stand is quaint in style, and has also chains and festoons of metal work, inlaid with malachite, to correspond with the casket. (See p. 328.)

PARQUET FOR FLOORS, FROM RUSSIA.

Russia seems to excel in the ingenious line of decorative art which concerns the inlaying of floors in various coloured woods, in divers devices. Amongst some very handsome specimens of the kind exhibited, was that which we have copied in our engraving. The design is extremely rich, and the general flow of the lines, both straight and curved, very harmoniously blended. It has been impossible, however, to represent in the engraving the almost endless variety of colours in which the design is worked out; the original must be seen to be appreciated. (See p. 328.)

ORNAMENTAL MIRROR.—BY KIDD.

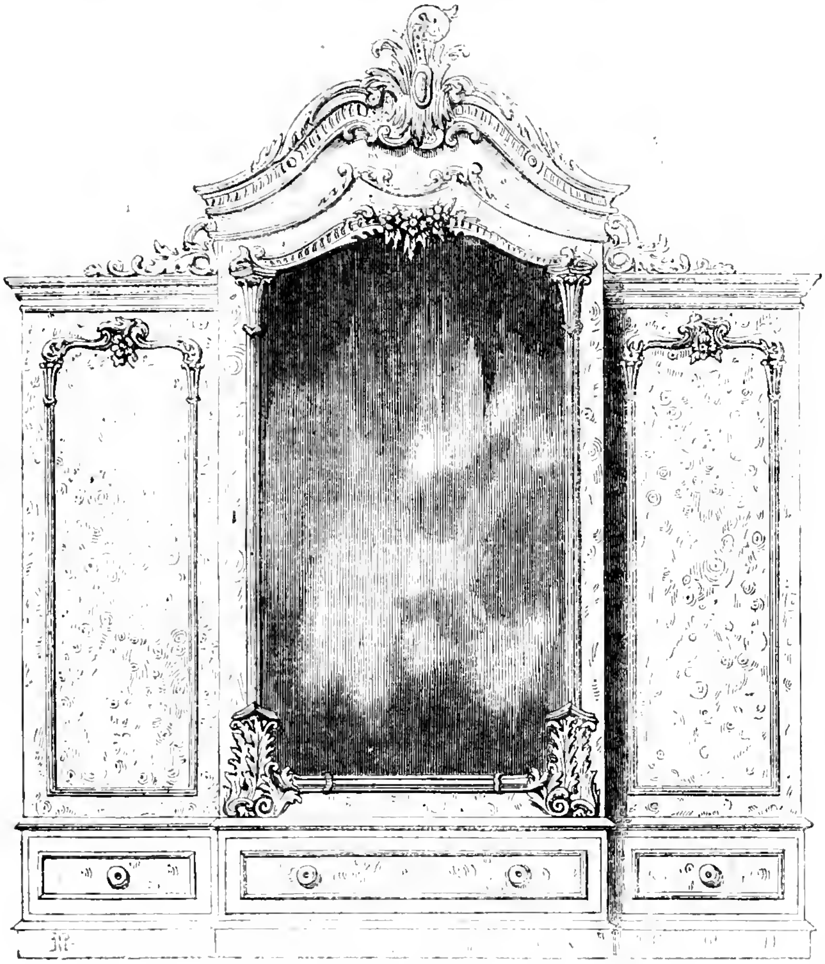
This very elegant piece of furniture is a specimen of a new process for illuminating, embroidering, and silvering flat surfaces in glass, adapted by Mr. Kidd, and applicable to a variety of subjects of an ornamental character. The designs are engraved on the under side of the glass, although they appear to be embossed in high relief upon the surface. (See p. 329.)

JEWELLED FIGURE OF BRITANNIA.—BY S. H. AND D. GASS.

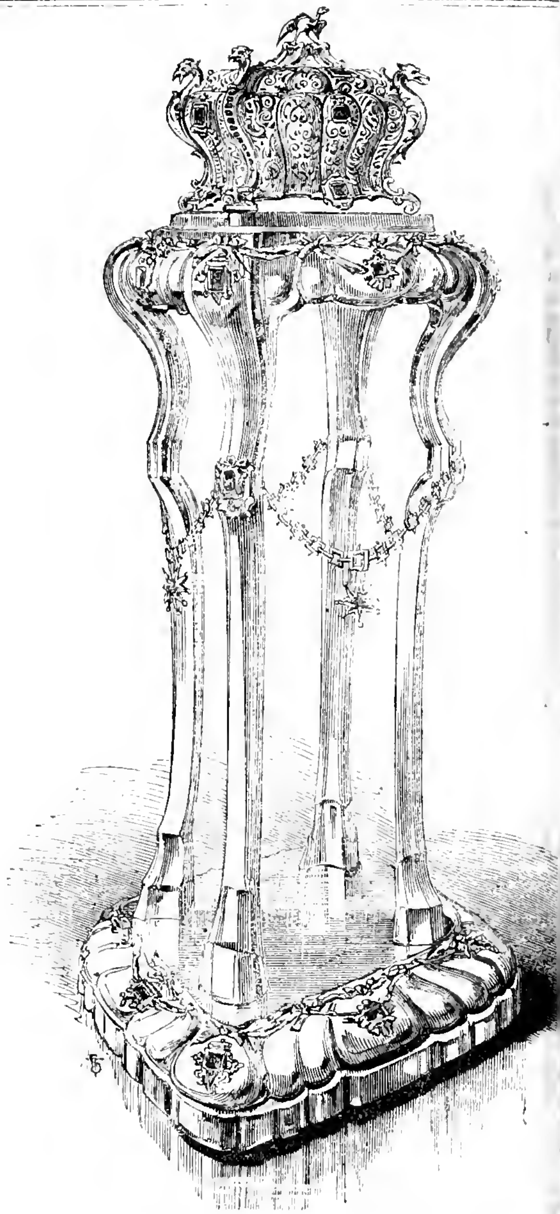
This brooch is of very elegant design, in the cinque-cento style. Under the portico of a Gothic arch, the figure of Britannia, holding with her right hand a trident, and her left resting on a rudder, stands on a shell, emblematical of her sovereignty over the seas. Beneath the shell is a winged dragon, representing the evil spirit of anarchy being expelled from peaceful Britain. The figure of Britannia is composed of upwards of 400 small brilliants, of old English cut, of the remarkable size of 250 to the carat; the comb of the helmet and rudder are set with small rubies: the two pieces on either side of the figure are cut from a single piece of carbuncle. The remainder of the brooch, with the dragon, is partly enamelled, and partly set with brilliants. The whole contains nearly 1000 stones, and the workmanship is of the most admirable character. (See p. 336.)

GROUP OF JEWELS.—BY BOLIN AND AIN.

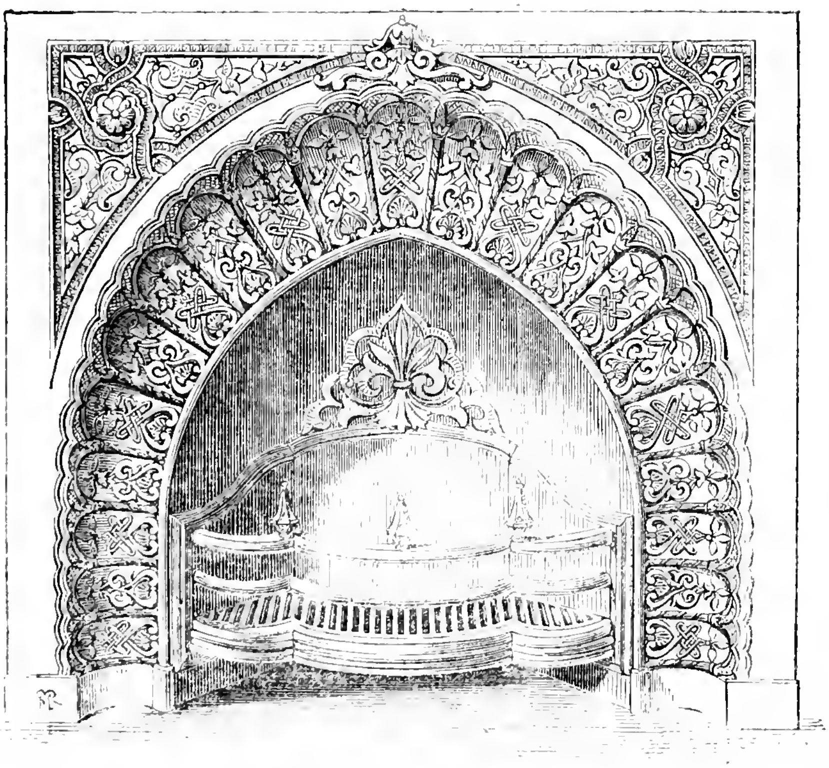
The group of jewels displayed by Messrs. Bolin and Ain, of St. Petersburgh, and which we have engraved, was justly an object of general admiration, both with artists in this line, and the general public. The principal piece is a diadem, containing 1800 brilliants, weighing 260 carats, and 1750 rose diamonds, in all 3500 diamonds, 11 opals, and 67 rubies. The diamonds are all of the first water, the opals some of the most beautiful we have ever beheld—the large one in the centre being, perhaps, remarkable for its rich and varying hues; the rubies are all well matched in colour, a matter very difficult to attain with this stone; the workmanship is of a high order; there is no silver employed in the mounting, all the stones being set *en griffe*. This, though a distinction which perhaps only a working jeweller will understand, deserves to be mentioned. The value fixed upon this diadem is 4800*l*. (See p. 336.)



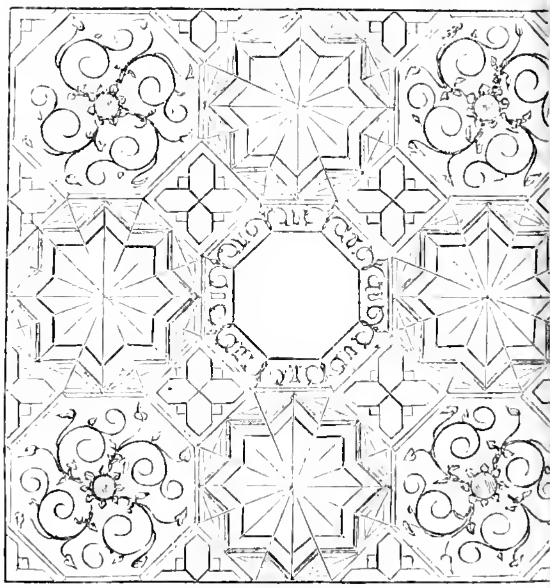
WARDROBE.—WILKINSON.



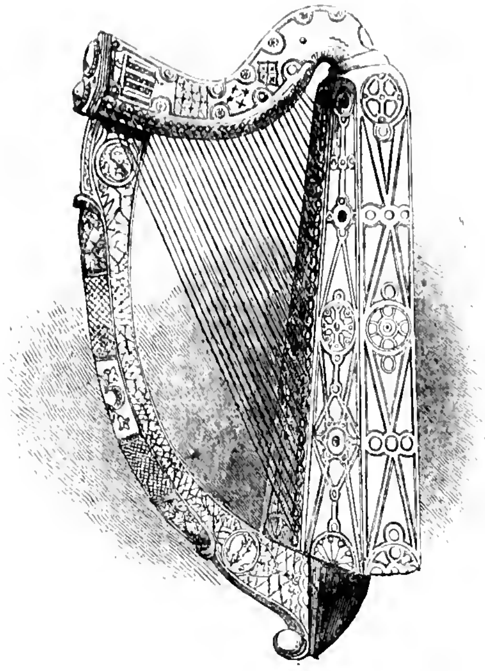
STAND AND CASKET.—WERTHEIMER.



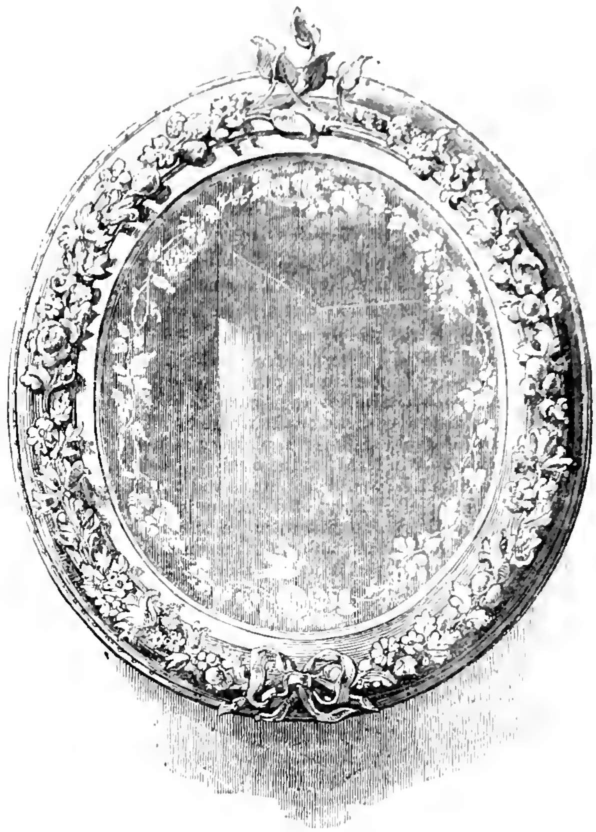
ALHAMBRA GRATE.—STEWART AND SMITH, SHEFFIELD.



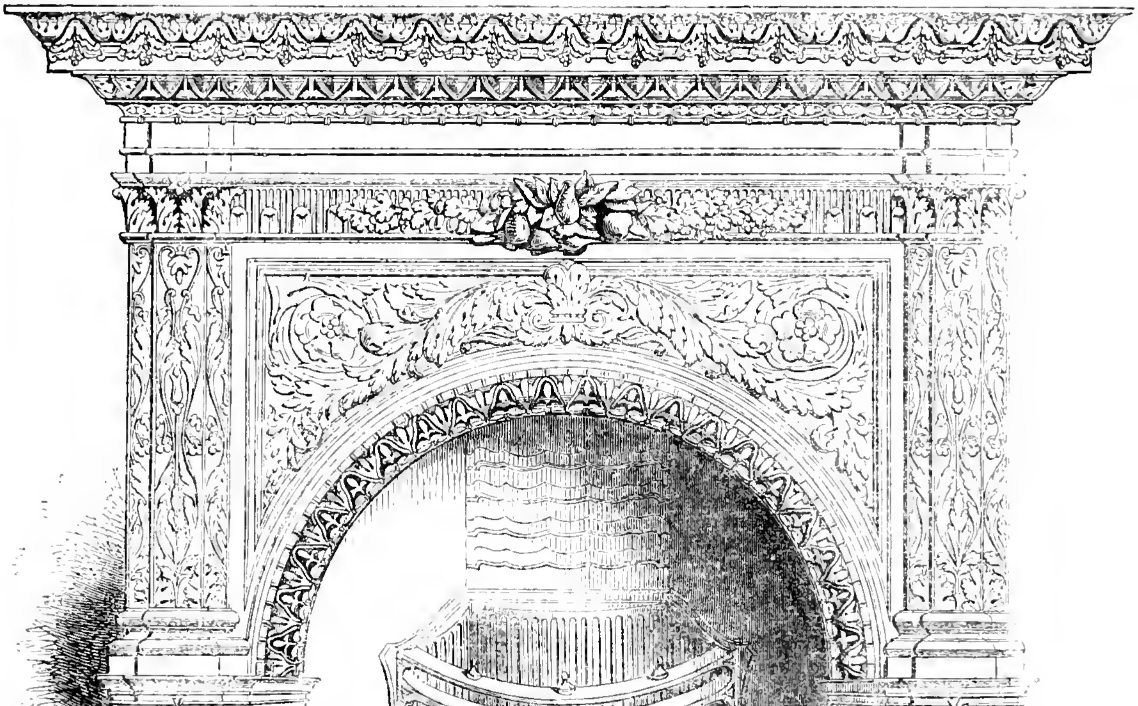
PARQUET FOR FLOORS, FROM RUSSIA.



MODEL OF BRYAN BOROIMHE'S HARP.—BALL, DUBLIN.



PATENT ORNAMENTED MIRROR.—W. KIDD.



STOVE.—MESSRS. CARR AND ROBERTSON.

FISHING-TACKLE AND FISH-HOOKS.

IF we were asked to tell the quality of champagne or sparkling hock ere the cork has flown, or to pronounce upon the originality of a Raphael or Correggio yet encased in their mahogany cabinets, we should be placed in a somewhat similar position to that in which we find ourselves with regard to the fishing-tackle in the Crystal Palace. It was all under lock and key, and enshrined in glass. A fishing-rod is not to be judged of by the eye. We would have every joint put together, and, when complete, a heavy weight attached by a line to the end. Thus loaded, it should be flung to and fro, and if, after a severe test of this description, it proved its strength of wood, cane, and ferule, it may be pronounced to have passed one ordeal. But there are others to which fishing-rods are necessarily subjected by the the side of the water—accidental circumstances which no foresight can anticipate, nor previous trial wholly prepare for.

In good old Izaac Walton's time, the true angler would as soon fish with a rod made by any other hand than his own, as set out upon his piscatorial excursion without his black velvet cap—such as jockeys now wear—his fishing coat with countless pockets, or the wherewithal to make a fly upon the instant. Thus he would stalk forth, plainly announcing his purpose to his neighbours; and, as if in fear that there might exist one who met him in ignorance of his intent, he would shoulder a rod of a single joint of some fourteen feet in length. Such a rod of all others is, perhaps, yet the best, and is still used by those who live within a short distance of lake or stream. As a fly rod it is incomparable, as it ensures the greatest freedom of play, uninterrupted by metal ferules, which add to the weight, and are most liable to cause fracture from their non-compliance with the elasticity of the other parts. We noticed but one rod of this description in the Exhibition; all, or nearly all, of those placed there being what are termed bag or jointed rods. Of these there was a goodly muster, showing a great variety—if not altogether pleasing, at least affording sufficient outward evidence that in this branch of sport-manufacture Great Britain need not fear rivalry.

On the contrary, for fly-fishing (the true *poetry* of the art), there was a very spare display, and that far from flattering to a land, the expertness of which in securing fish by this elegant means is famed throughout the globe. The greater portion of the exhibitors appear to have forgotten, or to have wilfully neglected, the more essential fact in this department—TRUTH—truth to nature. It is not opposed to fact, that at times fish will rise at any light nondescript thing thrown on the water—a tiny piece of red cloth or pull of beaver from the hat: but these are exceptions, and to accept as a rule that the instinct of fish is so low as to be so easily cheated, evinces a very incorrect knowledge of nature. It is an axiom amongst anglers (properly so called), if not amongst tackle-makers, that the closer the imitation of the fly thrown upon the water, the greater certainty of sport. It would seem, however, from what was presented to us in the Crystal Palace, that the salmon and the trout, like men, are to be tempted with made dishes, and that the more the natural thing be disguised the greater their *goût* for it. No greater fallacy can exist. If it be accepted, how is it that the accomplished fly-fisher prefers to fashion his fly upon the banks of the stream, and in the closest possible imitation of those most in swarm? It is not, we repeat, the scarce bait which contributes to the success of the fly-fisher, but that which is most plentiful.

What has been said with regard to flies, equally applies to the numerous attempts at imitating other entomological examples.

The "Engineering Department" of the fishing tackle, such as winches, &c., exemplified very little that is new, but that little was good. It has more than once occurred to us, that an intelligent journeyman chronometer maker might, in his leisure hours, turn his attention to the subject of winches, with no little profit to himself and satisfaction to anglers.

Nos. 152, 153, and 154, were three cases containing hooks, flies, &c., from T. Parkins, J. Rowell, and Martha Nicholas respectively; all of which may be accorded as fair samples of the Carlisle manufacture. The flies in the latter case were decidedly the best.

Nos. 156, W. Flynn, and 147, F. Allies, both of Worcester, exhibited flexible and horn baits of roach, gudgeon, sand eels, smelts, &c. They all involve the spiral or Archimedean screw principle, but few of them can be exempted from the imputation of being but sorry likenesses of the fish they are intended to represent. These baits are a modern introduction; and the increase in their number mainly arises from the desire of the retail tackle-maker to have, from time to time, some novelty or other wherewith to attract custom. On the score of usefulness they are below zero. They might, mayhap, prove of service in some far-off lake but just discovered by man, and where to obtain a live bait would occupy as much time as hooking the larger fish itself; but in civilised parts, where the real thing is to be had readily, it is a miserable waste of time to allow it to attach itself to any other line than that of its maker.

No. 157 was an Aberdeen salmon net, which we regret to see placed amongst the honourable weapons of legitimate angling.

No. 159. Kelly and Son, of Dublin, had a case containing several very neat specimens of fly-rods, and flies carefully made, but yet lacking a closer insight into nature. There was much, however, which is conducive to sustain the high reputation of the Irish character for fly-making.

No. 161 was an assortment of Redditch, in other terms, Brummagem tackle, famous amongst the disciples of Walton, for catching nothing but *flat* fish. And here a word upon cheap tackle may not be out of plac Although it does not necessarily follow that cheap tackle is the worst, o experience has tended to confirm us in the opinion, that in some instanc the prices are much too low to be good, while in others they assume t shape of positive extortion. As the finest chronometer, with the latest i provements, cannot be made to become intrinsically worth more than certain price without the aid of additional and unnecessary jewels, so fishing-rod, and other gear, do what you will, cannot be but of a certa value. Indeed, in the opinion of the true Waltonian, all decoration is me nonsense, and a good made rod, of a definite description, has as fixed standard as that of gold. We have seen silk-worm gut, purchased at che shops, which would not sustain an ounce, and single-hair astonishing on from its bearing the weight of the bait placed upon its hook; while trollir rods, procured at such places, have, upon the first cast, snapped, as if th had been rolled out of dough, and got crisp in the baking. It is, howev but justice to add, that these cheap tackle sellers in general do not profe this branch of trade exclusively, but intermix the tackle procured from t country with umbrellas, parasols, walking-sticks, cigars, &c.

No. 173. Pearce.—(Omitted in the Catalogue.)—We have been indebt to Mr. Pearce for a hearty laugh, and we willingly give him the benefit publicity for an invention as absurdly ridiculous in itself, as it serves show that its designer has altogether mistaken the mission and charact of the real angler. Here it is from his own description: "*A spring top catch fish without the aid of the angler. Many lines can be attached to one r The trigger relieves the top when the fish bites, which flies up and strikes it stantaneously.*" So that we are to set lines for fish as poachers do wires f game! Mr Pearce would make an admirable president at the next Tham Preservation Society's dinner—and would afford some rare sport there.

No. 174. Little and Co., sent a splendid collection of rods, three of whi were remarkable for their exquisite make, great beauty, and choice material; and although tastefully decorated, such decoration being ma wholly subservient to their utility. The first, a punt or roach rod, was Spanish white cane, as straight and true as possible. The butt of holl ivory, with gold mountings, bearing the Prince of Wales' plume in frost silver. The knob is of pearl; the ferules gold, and their stoppers thistles, carved in ivory, ornamented with the rose and shamrock; the to are of North Carolina cane of exquisite taper, and hollow within an in or so of the extreme end. This rod is ten feet in length. The second w a fly-rod of five joints. It bears the arms of H.R.H. Prince Albert, a differs from the other in finish only, from the mountings being in silv relieved in gold, and the stoppers being of pearl. The third was equa deserving of notice for its high finish. These three rods, moreover, prese a novelty in their ferules, which are so pierced as to relieve by a part yielding of their parts that sudden check and stress upon the wood whi we adverted to as an objection to ferules in general. This ferule has anot advantage. It can be readily adjusted to the wood-work without raspi down or rabiting, or in any other way weakening or removing the enam or hard portion of the cane at a part where strength is most required. T plain rods exhibited by Mr. Little are well calculated to sustain his rep tation. Farlow, Bernard, Bazin, Ainge and Aldred, Leadbeater, Jones a others, well-known houses, made a good display of serviceable articles.

In the United States department there were two salmon-rods from Halif roughly finished, but apparently capable of enduring work; and, fr certain peculiarities, we are inclined to trace their birth to Ireland or Irish hands. Beside these rods were two solitary salmon-flies—the o tolerably well and neatly dressed, the other negligent and loose.

Mr. Jones, of Jermyn-street, contributed for Norway and Canada a b fitted with rods, winches, lines, and flies for salmon-fishing in those countri This tackle has been evidently got up with great care, and there are indi tions in the details sufficient to prove that their manufacturer is devoti his energies with much success to the requirements of the angler in the interesting and now much visited sporting regions.

We ought to say something about what are termed "general rods"— rod that shall be made to do all descriptions of work. Such a rod is a gr device, and, like a Jack-of-all-trades, is master of none. For trolling bottom-fishing they bend under their labours, and for the fly they are t stiff and proud. You may send a line of invitation by them, but no fi will accept of it. Indeed, with fly-rods alone, two, or even three, are abs lutely necessary to the angler who throws over large as well as small stream the lightness of fall as well as length of cast being points of the la importance in different localities.

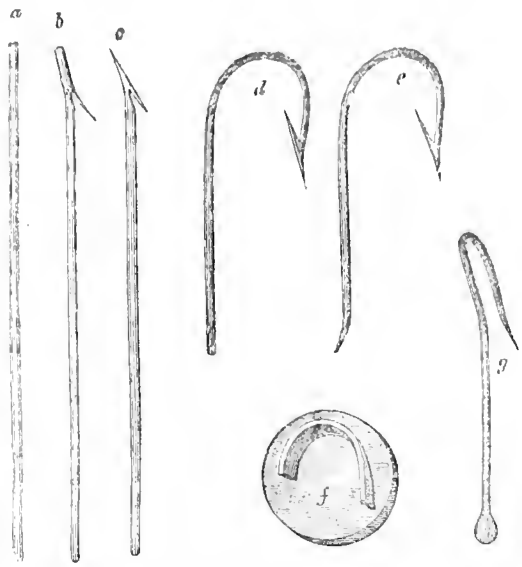
A few words, in conclusion, on the subject, of fish-hooks, and the mo in which they are manufactured, may not be unacceptable to our readers

There are numerous varieties of fish-hooks; some small and delica designed to be disguised with feathers, to serve as the lure for the silve fish in the meandering streams of our rural districts; others, rude a large, to serve in all their "naked barbarity" as the grappler of the oce shark: but in all of them the same features are discernible—the mo prominent of these being the sharp points and the barbs.

Previous to witnessing the manner of making the hooks in one of the be factories in England, the way in which the barbs were made was always mystery to us. Filing would do, but then the operation would be slow a tedious; whereas, from the cheap rate at which undressed hooks are sol we knew that the operation, to be paying, must necessarily be a quick on We shall endeavour to describe this process briefly.

The first operation in fish-hook making is cutting the steel wire of whic they are formed into lengths; this must necessarily vary according to th

ality of the hook: thus, figure *e* is the finished work made out of the re *a*. The wires are then softened by heating them in a small furnace. small standard, about two inches in height, is fastened to the bench at lich the workman sits; on the upper face of this, which is about one ch long by half an inch broad, there are three holes, into which the ends three wires may be inserted. The holes are so made, that the wires all at the same distance from each other, and their ends in the same e. From this management it results, that if a mark is made across ree wires inserted in the holes, the mark is upon each, at the same disnce from the ends; it follows, then, that thousands of wires originally the same length can be marked, all the marks being equidistant from ends. Alongside of this standard there is a contrivance on which a ife may rest, and exert a leverage in a certain direction. The workn thus provided, and seated at the bench, takes up three wires of the



pper length from a heap beside him, inserting their points in the three les; he rests the point of a narrow-bladed knife in the rest abovementioned, and pushing the knife from him towards the point of the res, and along their upper surface, beginning at a certain point near the ds, he cuts up a portion of the metal, in the manner shown in figure *b*. tering from the surface, and going gradually deeper, the barb is instanneously pointed. Taking out the three cut wires, he throws them aside d takes up another three, and cuts them as before. If a stranger were try the operation, he would find a difficulty, first, in inserting the three res in their respective holes; secondly, in adjusting the knife so as to mmence the cut exactly in the right place: and, thirdly, in making the t of the requisite depth, neither more nor less than sufficient to make the rb of the exact length. These three distinct operations—following so ose one upon another, that they may be said to form only one—are gone rough with amazing celerity, and with almost undeviating accuracy; so ich so, that out of many thousands made, it would be a difficult matter find two unlike one another in the length of their barbs, or "beards," the hook-makers call them. The next operation to be performed is inting the end of the hook (as seen in figure *c*). This is done by round; the point of each hook individually by means of a smooth file; the int being rested on a small block of box-wood, the other end grasped a pair of small plyers or pincers. The hooks have now to be rounded, at is, bent into the circular form so well known to the lovers of the entle art." A small round block of wood, some four inches long, and the diameter as shown in figure *f*, is provided with a piece of thin brass into its surface, and projecting therefrom about a quarter of an inch. is brass is bent into the form as shown in figure *f*; at one end there is small notch made, into which the barb of the wire is placed. The rkman takes up one of the barbed and pointed wires, and inserting the ok of the barb into the notch above-mentioned, twists the wire round e outside of the slip of brass, thus giving it the circular bend seen in ures *d* and *e*. If the reader will take a fish-hook in his hand, he will rceive that the wire is not bent, as seen in the side view of a hook given figure *f*. The bend is round equally, that is, it is not level, but rises, is bent upwards; the bend being given by the workman in a manner rious as it is simple. In bending the hook round the brass slip in *f*, tead of bending it round the whole of the slip on the same level, just he approaches the end, he raises his hand; this bends the wire upwards that particular part, and thus the peculiar curve seen in all fish-hooks given instantaneously. Such is the dexterity acquired by long practice, at in thousands of hooks the degree of bending in all of them is so nilar, that it would be a matter of difficulty to detect one more or less nt than another. The workman we saw operating, although an elderly n, bent one in every second, or thereabouts. The ends of each hook then flattened as at *e* and *g*, to afford a hold to the silk or other fastening used for uniting the hook to the [illegible] with marvellous rapidity, by laying the end on an anvil, and giving a smart blow with a light hammer. They are then tempered and polished, the latter operation performed by placing them in a barrel with water; the barrel is made to revolve, and the hooks rubbing against each other are soon polished. The delicate blue tint which all hooks have when bought in the shops, is imparted to them by heating them, and partially reducing the tempering. They are, after this, put up in parcels for sale.

PICTURE PRINTING IN COLOURS.

THE present state of this art, which has attained to considerable importance within the last few years, was admirably shown in the various examples contributed to the Fine Art Court.

As long ago as the middle of the fifteenth century we find ornamental initial letters, printed in two or three colours, by the Germans; and several specimens of picture-printing in *chiar'-oscuro* are now extant that were executed early in the sixteenth century. These attempts were continued at intervals, and were improved on by an Englishman, John Baptist Jackson, about the year 1740; and afterwards, about 1780, by another Englishman, named Skippe: but these, it must be understood, were mostly imitations of sepia or India-ink drawings, and not, properly speaking, colour printings. In the year 1818, William Savage published a quarto volume, entitled "Practical Hints on Decorative Printing," which contained some bold and clever illustrations of the art of colour-printing: but as far as regards its adaptation to the representation of pictures, we know of nothing further being done with it, until Mr. Baxter took out a patent for printing in oil colours from wood blocks and steel plates conjointly, and produced the illustrations to the "Cabinet of Painting," published by Chapman and Hall in 1836. Since then, various book-plates, some good and some bad, have been produced by the same process; and, in 1844, Messrs. Collins and Reynolds, pupils of Mr. Baxter, executed some very creditable colour-pictures for the "Old Story-books of England." These were done with wood blocks only. Mr. Baxter's patent expired about a twelvemonth since, when he applied for, and (thanks to Lord Brougham) obtained, a renewal of the privilege, and since then has produced a series of small colour-pictures, which, we understand, have met with a very extensive sale. Many of these pictures were exhibited by Mr. Baxter in one large frame. They are meritorious in their execution, pretty and pleasing, but most of them are inartistic, and some of them are from very bad drawings. The best are a copy of Raffaelle's "Madonna," which has a very finished look, and a new picture of the Great Exhibition Building.

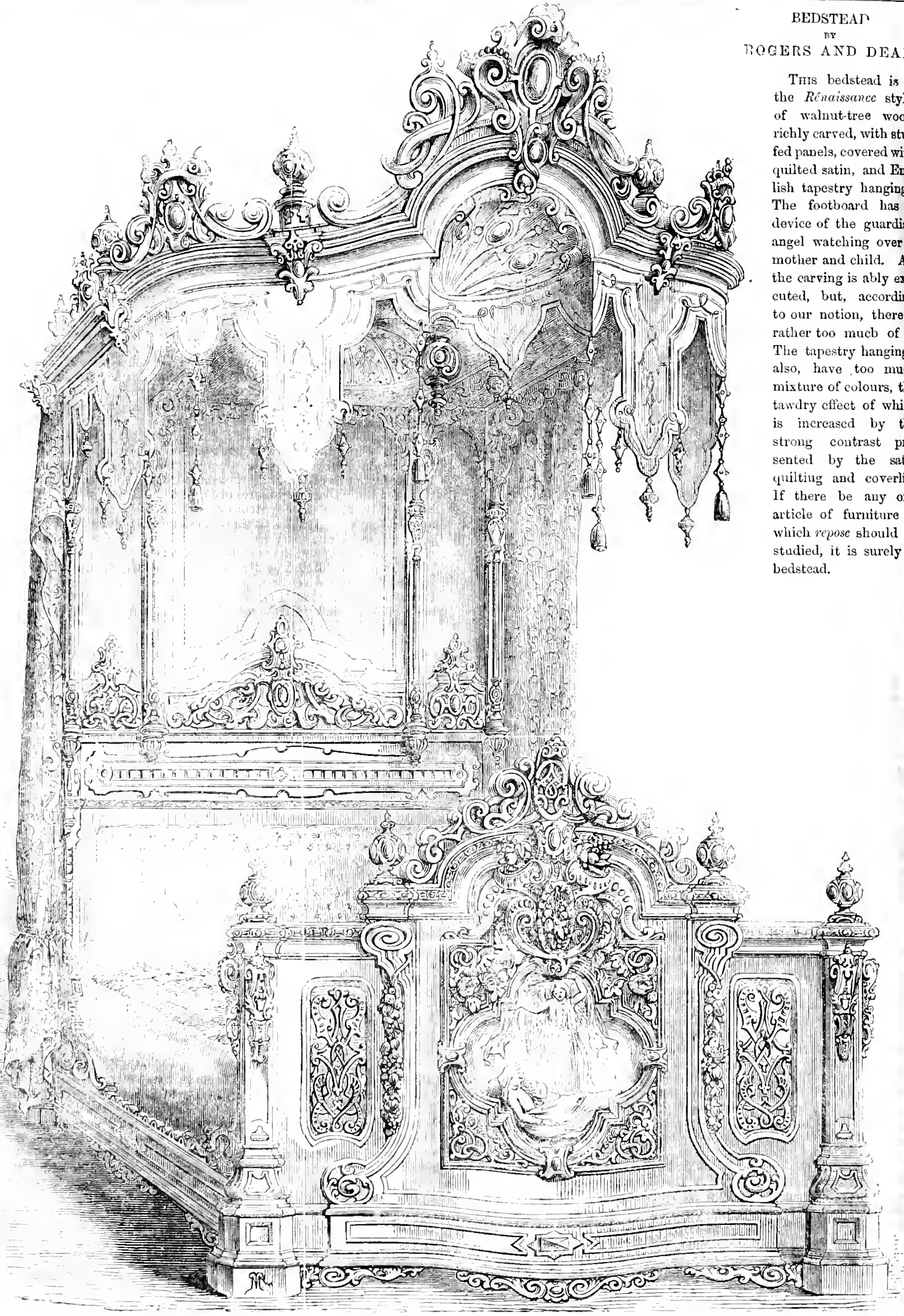
Messsrs. Leighton, of Lamb's Conduit-street, were the next exhibitors of wood block colour-printing, and we must say that the imitations of water-colour drawings which they have produced rank much higher as works of art. There are certain crudities and shortcomings which we would fain see corrected; but, with all their blemishes, their copies of drawings by Wehnert, Lee, Absolon, Weir, and Noble, must rank as the best contributions in this branch of the art. Messrs. Leighton do not use an engraved steel plate, as Mr. Baxter does, but gain many gradations of tone by means of mezzotinted metal plates, worked in the same way as the wood blocks. In each of the four pictures in the Exhibition we find traces of about sixteen to eighteen different printings.

Passing to the other side of the court, we found numerous examples of colour-printing by the lithographic press. First, we came to Mr. Owen Jones's exquisitely printed flowers and fruits. These were as near perfection as we ever expect to see in works of this class; both the delicacy of tone and the deep richness of colour of nature were most admirably presented, and far surpassed in effect the efforts of ordinary water-colour painting. We should like to see Mr. Owen Jones try an imitation of one of Lance's fruit-pieces, or Mrs. Margett's flowers—not that we doubt his power of rendering them beautifully, but that we wish to see how far the art can be carried.

We next came to a frame containing Messrs. Hanhart's productions, and these made us linger long. The copy of Mr. Creswick's "Forest Farm" is excellent—in some parts as good as can be hoped for, especially the sky, the far distance, and the trees; the farm-house is not quite so successful; but we hear that Mr. Coventry, to whose hand-craft this work is attributable, promises a more perfect copy at a second proving of the stones. But Mr. Frederick Tayler's "English Squire," lithographed in colours by John Brandard, is Messrs. Hanhart's pride; and well it may be. We do not hesitate to award to it the highest praise.

Messrs. Hullmandel and Walton showed excellent specimens of their lithotint drawings; and then we came to Mr. Day's splendid contribution, "The Destruction of Jerusalem," by David Roberts, lithographed by Louis Haghe. This is a very extraordinary production—the largest picture we believe, ever drawn on stone, and certainly a most successful one. It is hardly an example of colour-printing, for there are but two or three tint-stones used; and it is more for its grandeur as a work of art than for any application of a new art that we admire it. The published drawings of Roberts's "Holy Land," lithographed by the same artist, are too well known to need more than a passing word of commendation.

Of Mr. Kronheim's elaborate copy of "The Descent from the Cross," on which it is said some large sums of money have been expended, we cannot speak with praise. It may be mechanically—it certainly is not artistically—good. With most of the minor specimens of this interesting art exhibited, we are all sufficiently conversant.



BEDSTEAD
BY
ROGERS AND DEAN

THIS bedstead is i the *Rénaissance* styl of walnut-tree woo richly carved, with stu fed panels, covered wit quilted satin, and Eng lish tapestry hanging. The footboard has device of the guardia angel watching over mother and child. A the carving is ably ex cuted, but, accordin to our notion, there rather too much of i The tapestry hanging also, have too muc mixture of colours, tl tawdry effect of whi is increased by tl strong contrast pr sented by the sat quilting and coverli If there be any o article of furniture which *repose* should studied, it is surely bedstead.

LECTURES ON THE EXHIBITION.

R. WHEWELL ON THE GENERAL BEARINGS OF THE GREAT EXHIBITION ON THE PROGRESS OF SCIENCE AND ART.

ORTLY after the closing of the Great Exhibition, Prince Albert, as President of the Society of Arts, suggested that a series of lectures should delivered before that body, by able Professors, upon different branches science and manufacture illustrated in that great International Congress ndustry. This useful idea was at once adopted, and lectures announced but uncultured life, Queen Pomare sends mats and cloths, head dresses and female gear, which the native art of her women fabricates from their indigenous plants. From Labuan, the last specimen of savage life with which this country has become connected, we have also clothes and armour, weapons and musical instruments. From all the wide domains which lie within or around our Indian Empire we have rich and various contributions; from Singapore and Ceylon, Celebes and Java, Mengatal and Palembang. The ruder and more primitive of these regions send us their native food and clothing, their fishing nets and baskets; but art soon goes beyond these first essays. From Sumatra we have the loom and the plough, lacquered

ROSEWOOD CABINET.—PETOT.

Dr. Whewell, Master of Trinity College, Cambridge; Sir Henry de la che; Professor Owen; Dr. Lyon Playfair, and others, the first of which s delivered on November 26th. In order to give the more completeness this humble record of the Great Exhibition, we propose giving some of most remarkable and interesting passages from these discourses.* Commencing with Dr. Whewell's lecture, we find the following eloquent remarks on the general tendency of the Great Exhibition :—

"Now, that which this scientific dream thus presents to us in imagination, t Exhibition of the Industry and Arts of All Nations has presented as a ble reality; for we have had there collected examples of the food and thing and other works of art of nations in every stage of the progress of a From Otaheite, so long in the eyes of Englishmen the type of gentle work and silken wares; and as we proceed from these outside regions to that central and ancient India, so long the field of a peculiar form of civilisation, we have endless and innumerable treasures of skill and ingenuity of magnificence and beauty. And yet we perceive that, in advancing from these to the productions of our own form of civilisation, which has, even in that country, shown its greater power, we advance also to a more skilful, powerful, comprehensive, and progressive form of art. And looking at the whole of this spectacle of the arts of life in all their successive stages, there is one train of reflection which cannot fail, I think, to strike us; namely, this:—In the first place, that man is, by nature and universally, an artificer, an artisan, an artist. We call the nations, from which such specimens came as those which I first mentioned, rude and savage, and yet how much is there of ingenuity, of invention, of practical knowledge of the properties of branch and leaf, of vegetable texture and fibre, in the works of the rudest

* These Lectures are published in a cheap form, by Bogue, of Fleet-street.

tribes! How much, again, of manual dexterity, acquired by long and persevering practice, and even so, not easy! And then, again, not only how well adapted are these works of art to the mere needs of life, but how much of neatness, of prettiness, even of beauty, do they often possess, even when the work of savage hands! So that man is naturally, as I have said, not only an artificer, but an artist. Even we, while we look down from our lofty summit of civilised and mechanically-aided skill upon the infancy of art, may often learn from them lessons of taste. So wonderfully and effectually has Providence planted in man the impulse which urges him on to his destination,—his destination, which is, to mould the bounty of nature into such forms as utility demands, and to show at every step that with mere utility he cannot be content. And when we come to the higher stages of cultured art—to the works of nations long civilised, though inferior to ourselves, it may be, in progressive civilisation and mechanical power, how much do we find in their works which we must admire, which we might envy, which, indeed, might drive us to despair! Even still, the tissues and ornamental works of Persia and of India have beauties which we, with all our appliances and means, cannot surpass. The gorgeous East showers its barbaric pearl and gold into its magnificent textures. But is there really anything *barbaric* in the skill and taste which they display? Does the Oriental prince or monarch, even if he confine his magnificence to native manufactures, present himself to the eyes of his slaves in a less splendid or less elegant attire than the nobles and the sovereigns of this our Western world, more highly civilised as we nevertheless deem it? Few persons, I think, would answer in the affirmative. The silks and shawls, the embroidery and jewellery, the moulding and carving, which those countries can produce, and which decorate their palaces and their dwellers in palaces, are even now such as we cannot excel. *Oriental* magnificence is still a proverbial mode of describing a degree of splendour and artistical richness which is not found among ourselves.

What, then, shall we say of ourselves? Wherein is our superiority? In what do we see the effect, the realisation, of that more advanced stage of art which we conceive ourselves to have attained? What advantage do we derive from the immense accumulated resources of skill and capital—of mechanical ingenuity and mechanical power—which we possess? Surely our imagined superiority is not all imaginary; surely we really are more advanced than they, and this term "advanced" has a meaning; surely that mighty thought of a PROGRESS in the life of nations is not an empty dream; and surely our progress has carried us beyond them. Where, then, is the import of the idea in this case? What is the leading and characteristic difference between them and us, as to this matter? What is the broad and predominant distinction between the arts of nations rich, but in a condition of nearly stationary civilisation, like Oriental nations, and nations which have felt the full influence of progress like ourselves?

If I am not mistaken, the difference may be briefly expressed thus:—That in those countries the arts are mainly exercised to gratify the tastes of the few; with us, to supply the wants of the many. There, the wealth of a province is absorbed in the dress of a mighty warrior; here, the gigantic weapons of the peaceful potentate are used to provide clothing for the world. For that which makes it suitable that machinery, constructed on a vast scale, and embodying enormous capital, should be used in manufacture, is that the wares produced should be very great in quantity, so that the smallest advantage in the power of working, being multiplied a million fold, shall turn the scale of profit. And thus such machinery is applied when wares are manufactured for a vast population;—when millions upon millions have to be clothed, or fed, or ornamented, or pleased, with the things so produced. I have heard one say, who had extensively and carefully studied the manufacturing establishments of this country, that when he began his survey he expected to find the most subtle and refined machinery applied to the most delicate and beautiful kind of work—to gold and silver, jewels, and embroidery: but that when he came to examine, he found that these works were mainly executed by hand, and that the most exquisite and the most expensive machinery was brought into play where operations on the most common materials were to be performed, because these were to be executed on the widest scale. And this is when coarse and ordinary wares are manufactured for the many. This, therefore, is the meaning of the vast and astonishing prevalence of machine-work in this country:—that the machine with its million fingers works for millions of purchasers, while in remote countries, where magnificence and savagery stand side by side, tens of thousands work for one. There Art labours for the rich alone; here she works for the poor no less. There the multitude produce only to give splendour and grace to the despot or the warrior, whose slaves they are, and whom they enrich; here the man who is powerful in the weapons of peace, capital and machinery, uses them to give comfort and enjoyment to the public, whose servant he is, and thus becomes rich while he enriches others with his goods. If this be truly the relation between the condition of the arts of life in this country and in those others, may we not with reason and with gratitude say that we have, indeed, reached a point beyond theirs in the social progress of nations?"

After describing the principles upon which the classification of objects was carried out, which he thinks an improvement upon the whole of that adopted at previous expositions, the lecturer illustrates his position with some pertinent and suggestive remarks:—

"There is one other remark which I should wish to make, suggested by the classification of the objects of the Exhibition: or, rather, a remark which it is possible to express, only because we have such a classification before us. It is an important character of a right classification, that it makes general propositions possible; a maxim which we may safely regard as we[ll] grounded, since it has been delivered independently by two persons, [n]o less different from one another than Cuvier and Jeremy Bentham. No[w,] in accordance with this maxim, I would remark, that there are gener[al] reflections appropriate to several of the divisions into which the Exhibitio[n] is by its classification distributed. For example: let us compare the Fir[st] Class, *Mining and Mineral Products*, with the Second Class, *Chemic[al] Processes and Products.* In looking at these two classes, we may see som[e] remarkable contrasts between them. The first class of arts, those whi[ch] are employed in obtaining and working the metals, are among the mo[st] ancient; the second, the arts of manufacturing chemical products on a lar[ge] scale, are among the most modern which exist. In the former class, as [I] have said, Art existed before Science; men could shape, and melt, an[d] purify, and combine the metals for their practical purposes, before th[ey] knew anything of the chemistry of metals; before they knew that to puri[fy] them was to expel oxygen or sulphur; the combination may be definite [or] indefinite. Tubal-Cain, in the first ages of the world, was 'the instruct[or] of every artificer in brass and iron;' but it was very long before there ca[me] an instructor to teach what was the philosophical import of the artifice[r's] practices. In this case, as I have already said, Art preceded Science: [is] even now Science has overtaken Art; if even now Science can tell us wh[y] the Swedish steel is still unmatched, or to what peculiar composition t[he] Toledo blade owes its fine temper, which allows it to coil itself up in [its] sheath when its rigid thrust is not needed. Here Art has preceded Scienc[e] and Science has barely overtaken Art. But in the second class, Science h[as] not only overtaken Art, but is the whole foundation, the entire creator [of] the art. Here Art is the daughter of Science. The great chemical man[u]factories which have sprung up at Liverpool, at Newcastle, at Glasgow, o[we] their existence entirely to a profound and scientific knowledge of chemistr[y.] These arts never could have existed if there had not been a science [of] chemistry; and that, an exact and philosophical science. These manuf[ac]tories now are on a scale at least equal to the largest establishments whi[ch] exist among the successors of Tubal-Cain. They occupy spaces not smaller th[an] that great building in which the productions of all the arts of all the world we[re] gathered, and where we so often wandered till our feet were weary. Th[ey] employ, some of them, five or six large steam-engines; they shoot up t[all] obelisks which convey away their smoke and fumes to the height of t[he] highest steeples in the world; they occupy a population equal to that of [a] town, whose streets gather round the wall of the mighty workshop. Y[et] these processes are all derived from the chemical theories of the last a[nd] the present century; from the investigations carried on in the laboratories [of] Scheele and Kirwan, Berthollet and Lavoisier. So rapidly in this case h[as] the tree of Art blossomed from the root of Science; upon so giganti[c a] scale have the truths of Science been embodied in the domain of Art.

Again, there is another remark which we may make in comparing t[he] First Class, *Minerals*, with the Third Class, or rather with the Four[th,] *Vegetable and Animal Substances, used in manufactures, or as implements [or] ornaments.* And I wish to speak especially of *vegetable* substances. In t[he] class of *Minerals*, all the great members of the class are still what they we[re] in ancient times. No doubt a number of new metals and mineral substanc[es] have been discovered; and these have their use; and of these the Exhibiti[on] presented fine examples. But still, their use is upon a small scale. Go[ld] and iron, at the present day, as in ancient times, are the rulers of the worl[d;] and the great events in the world of mineral art are not the discovery [of] new substances, but of new and rich localities of old ones,—the opening [of] the treasures of the earth in Mexico and Peru in the sixteenth century, [of] California and Australia in our own day. But in the vegetable world t[he] case is different; there, we have not only a constant accumulation and repr[o]duction, but also a constantly growing variety of objects, fitted to the nee[ds] and uses of man. Tea, coffee, tobacco, sugar, cotton, have made man's li[fe] and the arts which sustain it, very different from what they were in ancie[nt] times. And no one, I think, can have looked at the vegetable treasures [of] the Crystal Palace without seeing that the various wealth of the vegetab[le] world is far from yet exhausted. The Liverpool Local Committee ha[ve] enabled us to take a starting-point for such a survey by sending to th[e] Exhibition a noble collection of specimens of every kind of import of th[at] great emporium; among which, as might be expected, the varieties [of] vegetable produce are the most numerous. But that objects should b[e] reckoned among *imports*, implies that already they are extensively use[d.] If we look at the multiplied collections of objects of the same kind, som[e] from various countries, not as wares to a known market, but as specime[ns] and suggestions of unexplored wealth, we can have no doubt that the li[st] of imports will hereafter, with great advantage, be enlarged. Who know[s] what beautiful materials for the makers of furniture are to be found in th[e] collections of woods from the various forests of the Indian Archipelago, or [of] Australia, or of Tasmania, or of New Zealand? Who knows what we ma[y] hereafter discover to have been collected of fruits and oils, and medicine[s] and dyes; of threads and cordage, as we *had* here from New Zealand an[d] from China examples of such novelties; of gums and vegetable substance[s] which may, in some unforeseen manner, promote and facilitate the processe[s] of art! How recent is the application of caoutchouc to general purposes! Yet we know now—and on this occasion America would have taught us [if] we had not known—that there is scarcely any use to which it may not b[e] applied with advantage. If a teacher in our time were to construct maxim[s] like those of the son of Sirach in the ancient Jewish times—like him who say[s] (Ecclus. xxxix. 26), 'The principal things for the whole use of man's life ar[e] water, fire, iron, and salt, flour of wheat, honey, milk, and the blood of th[e]

gpe, oil, and clothing'—he could hardly fail to make additions to the li and these would be from the vegetable world. Again, how recent is tl discovery of the uses of gutta-percha! In the great collection were sce of the original specimens sent by Dr. Montgomery to the India House, whnce specimens were distributed to various experimentalists. Yet how vaous and peculiar are now its uses, such as no other substance could hace! And is it not to be expected that our contemporaries, joining the light of science to the instinct of art, shall discover, among the various sorces of vegetable wealth which the Great Exhibition has disclosed to thn, substances as peculiar and precious, in the manner of their utility, as the aids thus recently obtained for the uses of life!

nd before we quit this subject, let us reflect, as it impossible, I think not to reflect, when viewing th the constantly enlarging sphere of the utility wch man draws from the vegetable world, what a ew this also gives us of the bounty of Provi-dce to man, thus bringing out of the earth, in evy varying clime, endless forms of vegetable life, ofhich so many, and so many more than we yet catell, are adapted to sustain, to cheer, to benefit, toelight man, in ways ever kind, ever large, ever ne, and of which the novelty itself is a new source ofelighted contemplation."

BANKS' TWIN STAIRCASE.

R. BANKS erected in one of the north-west ave-nus of the Nave, a double or twin staircase, which, comunicating with the gallery above, was daily mae use of by the public. It was intended as a spimen of what may be done in a small space the being here two staircases, one for parties aending, the other for those descending, in the area or pace, which would be devoted to one flight under the ordinary method of construction. This contriv-an is considered particularly adapted for cabins ofhips, picture galleries, show-rooms, and tempo-rar erections, where a great influx of visitors is liky to attend; being capable of being put up at a sht notice, and at comparatively small expense. Th principle of construction is very simple, being mely an adaptation in extreme limits of the wl-known properties of the spiral curve, or spring-arch. The ascent is necessarily steep, there beg no less than thirty-eight steps in each semi-cilar flight, the diameter of the plane of which, de not exceed a dozen feet, whilst the height is twty-three feet. The length of the step is four fe and the length of the outer string-board, fiy-seven feet. Each flight lands on a circular coidor, which intersects two of the galleries of thbuilding at right angles with each other. The ra are continuous ones, so that a person ascend-inand placing either hand on the rail, may con-tie with the same on the rail during the ascent, the way across the corridor, and all the way down the opposite flight. This invention exhibits con-sirable ingenuity, and is likely to be extensively usul.

DEBOARD.—BY THE GUTTA PERCHA COMPANY.

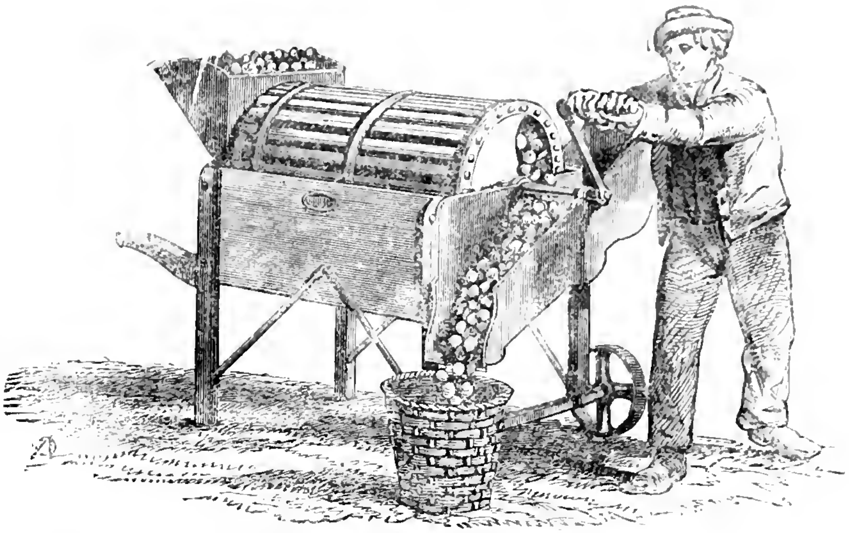
HE glass-frame and side-board, exhibited by the Gta Percha Company, is intended as a specimen ofhat may be done in their material upon a large se, as a substitute for wood-carving, &c. We mt be excused from investigating its beauties as work of art; as a piece of serviceable furniture, hoever, we have our misgivings about it or any thg of the kind composed of this treacherous mrial. The card affixed to this sideboard an-nced that it is intended to exhibit the capabilities ofhis material for ornamental purposes, "parti-cuarly the long-sought-for desideratum of a non-frgle pendant." Unfortunately, although this hily-decorated structure in gutta-percha was care-fuy surrounded by a cordon, and had yet expe-rieced no wear and tear—we discovered symptoms of islocation in part of the "pendant" foliage, and soething like a "split" in a pear of no ordinary dinsions. (See p. 325.)

ROSEWOOD CABINET.—BY PETOT.

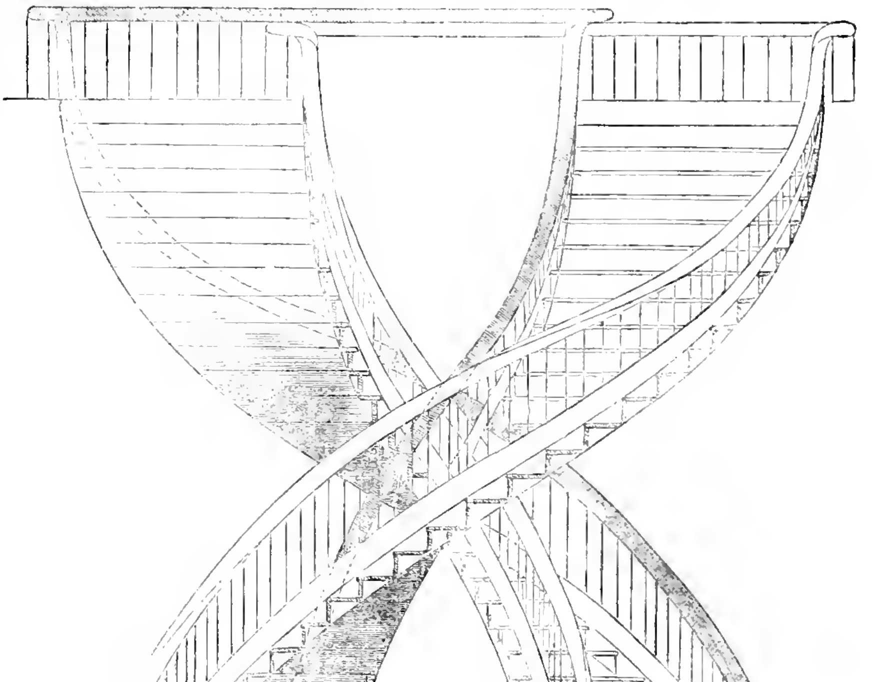
Tis is a very showy piece of furniture in the Louis X style, made of rosewood and tulip-wood, richly ind with marquetrie and buhl. It is peculiarly Frch in style, and wants that solidity of appear-an at least, which distinguishes the best English fuiture. (See p. 333.)

CROSKILL'S ROOT WASHER.

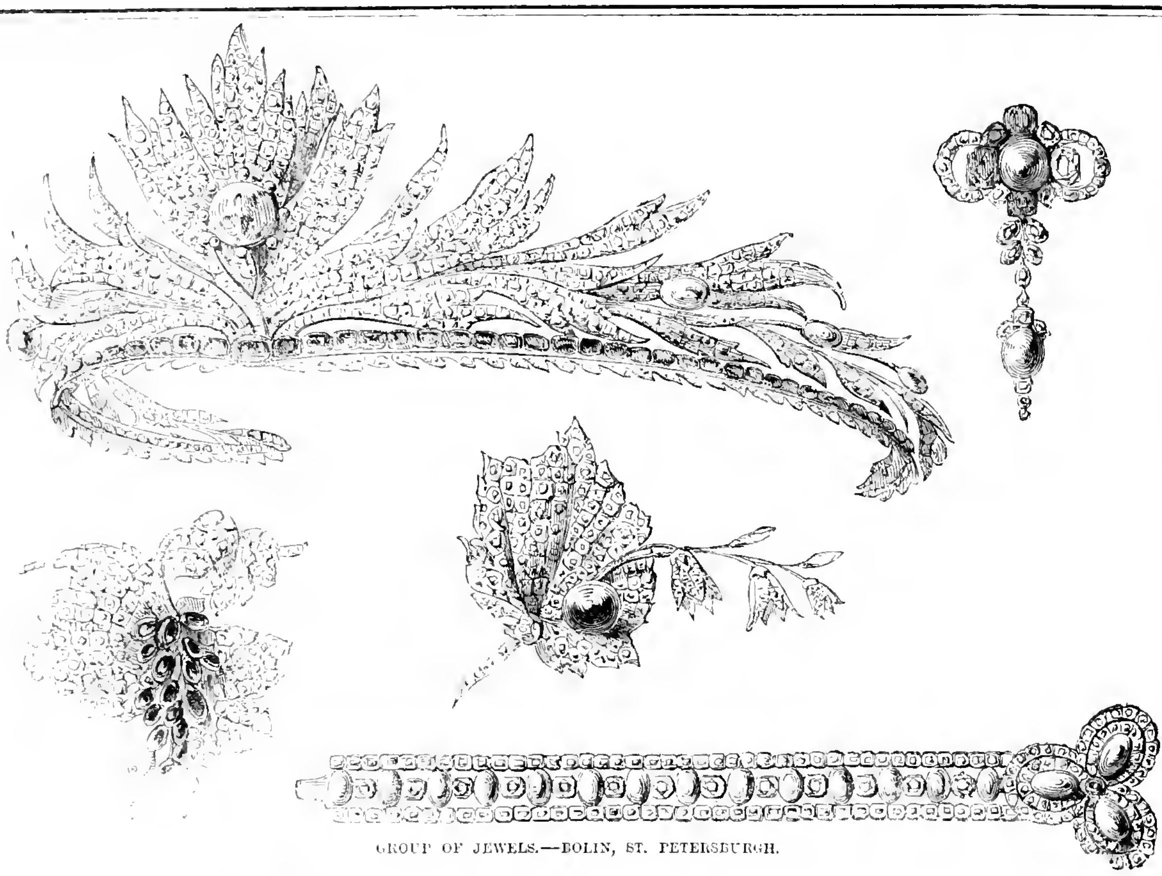
This is a very simple and convenient machine, in which the principle of the Archimedean screw, has been ingeniously applied. The roots are delivered into a hopper, and passed thence into an inclined cylinder, having two chambers, in the first of which they are confined and washed by turning the handle in one direction; when thoroughly cleaned, the motion is reversed, and they pass into the second chamber, which is constructed in the form of a spiral, along which they pass until they drop into a spout outside. It is well adapted for carrots, potatoes, turnips, and most other roots.



CROSSKILL'S ROOT-WASHER.

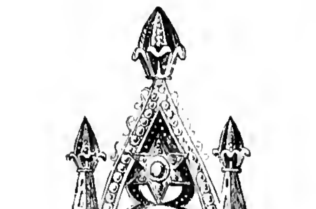


BANKS' TWIN STAIRCASE.



GROUP OF JEWELS.—BOLIN, ST. PETERSBURGH.

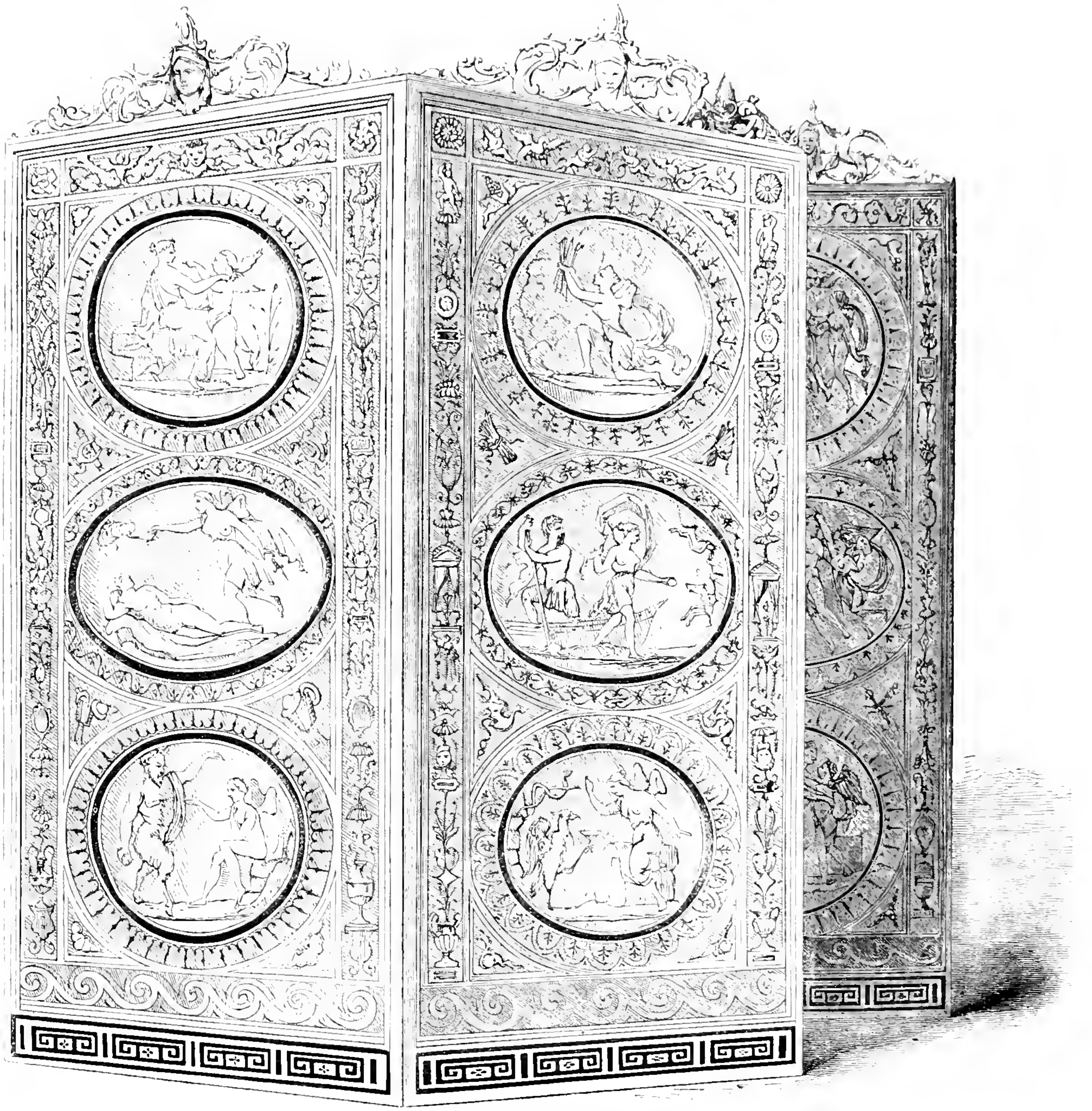
ORNAMENTAL CHINA.—MINTON.



JEWELLED FIGURE OF BRITANNIA.

The CRYSTAL PALACE AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.



PAINTED SCREEN. EARLE.

MR. EARLE's contribution being in encaustic, the painting found admission to the Crystal Palace, as not coming within the rule excluding works of painting in oil, water-colour, and fresco. It is a production of ordinary merit. The subjects are in imitation of antique gems, representing the story of Cupid and Psyche. 1. Cupid stung by a bee, shows his wounded finger to Venus. 2. Psyche contemplating the murder of Cupid. 3. Psyche and Pan. 4. Psyche propitiates Ceres. 5. Psyche giving the soporific cakes. 6. The Eagle giving the vase of black water to Psyche. 7. Psyche receiving the casket of perfumes from Proserpine. 8. Psyche with the casket of perfume received from Proserpine. 9. Psyche presenting the casket to Venus, which appeases her anger and extinguishes her jealousy. 10. Mercury, commanded by Jupiter, bringing Psyche back to Olympus. 11. Psyche transported by Zephyr to a grove, and placed in the arms of Cupid. 12. Cupid and Psyche in the bower.

TEXTILE MANUFACTURES.

DYEING AND CALICO PRINTING.

COTTON is dyed in the state of fibre only to a very limited extent. It is dyed black in this state for the manufacture of "wadding;" and small quantities are tinged pink or rose colour, by means of safflower, for the use of the jeweller. In Class IV. Mr. Claussen exhibited some of his flax cotton, dyed in the fibre in several colours, to show the capability of his material for mixture with dyed wool in the cloth manufacture.

Cotton is dyed extensively in the state of yarn for the manufacture of thread—sewing thread, crochet-thread, &c. Sewing-thread, in many colours, was shown by Messrs. Brook, of Huddersfield, and Mr. W. Evans, of Derby; and very brilliant tints of the same were exhibited by Mr. Thackeray, of Nottingham, but dyed by Mr. Townsend, of Coventry. Excellent colours in crochet thread were shown by Messrs. Marsland, of Manchester. In the foreign department we may mention with deserved encomium Messrs. Meischer, of Switzerland, and Ferdinand Taulen, of Vienna.

Dyed cotton yarn is used extensively for woven goods, such as shirtings, striped and checked fancys, ginghams, "Bengal stripes," "Panos da Costa," &c. &c. Mr. P. Dixon, of Carlisle, exhibited an extensive series of dyed cotton yarns, and of the woven goods manufactured from them. Nearly every description of the same class of goods was shown by Messrs. Lowthian and Parker, of the same city. It appears to us, however, that the Carlisle dyers are somewhat behind their rivals north of the Tweed, as regards the brilliancy of the colours, particularly of the reds. Nothing can exceed the beautiful checks and tartans exhibited by the Messrs. Anderson, of Glasgow, Messrs. H. Fyfe and Co., and other Glasgow houses. Very brilliant cotton dyes were shown on the woven goods exhibited by Messrs. Tricot, Rouen, Naef, canton St. Gall, Switzerland; and M. Kretschmann, of Eisenberg, Prussia. The latter showed his peculiarly brilliant yarns manufactured into a peculiar fabric for the making of slippers, bags, &c.

Cotton is also dyed in the piece; numerous examples were shown in calicoes, fustians, velvets, &c. We particularly remarked the very beautiful cotton velvets exhibited by Messrs. W. Andrews and Sons, Manchester. The success of their peculiar dye and finish is such as to render the "patent cotton velvet" nearly equal in colour and brilliance to silk.

In whatever stage of the manufactured fibre the dye may be applied, the chemistry of the process is the same. The colours are fixed by causing the substance which forms the dye to pass from the liquid to the solid state within the pores of the fibre. Thus the deep blues which we observed in the beautiful stripes of Messrs. Dixon, Tricot, and Naef, are dyed with indigo. To fix this insoluble substance we first render it soluble by bringing it into contact with lime or alkilis, and deoxidising substances. If we mix finely-powdered indigo with lime and green copperas dissolved in water, the blue colour of the indigo disappears, and we have a compound of indigo, deprived of a certain portion of oxygen, and lime, which dissolves in the water, yielding a greenish yellow solution. If we immerse cotton in this solution, the pores become filled by it, and on taking the cotton into the air, oxygen is rapidly absorbed, the blue insoluble indigo is again formed, and becomes fixed within the cells of the fibre.

The beautiful pink on cotton to be seen on many specimens of thread, and on one of the velvets of the Messrs. Andrews, is dyed with carthamine, the red colouring principle of safflower. This substance dissolves in alkalis, and is again rendered soluble by the vegetable acids, and we avail ourselves of this property to fix it upon the fibre. There are a number of "substantive" colours, *i. e.*, of colours which afford dyes without being combined with other substances; but a large class of dyes are called "adjective," and require the aid of a "base" or "mordant," to become fixed upon cotton. The valuable dye-stuff, madder, is of this class. Cotton boiled in water to which madder-root has been added takes a mere dirty tinge, which is removed by soap and water: but if the cotton be first soaked in a salt of alumina or of iron, and dried, the earth or oxide is fixed within its pores, and constitutes the base or mordant; and if the cotton be now boiled with madder, a full permanent colour results. If alumina has been used, the colour is red or pink, according to the quantity of mordant employed: if iron has been used, the colour is lilac or deep purple; and if a mixture of the two bases has been employed, it is puce or chocolate. In fact, the colouring matter of madder is not coloured and insoluble until combined with the base, and this insoluble compound may be prepared separately, and is then called a lake. Very beautiful madder lakes—the substance we have been just describing—were exhibited by Messrs. Winsor and Newton, in Class II., and by other exhibitors in the foreign department. Crimson lakes may be prepared from cochineal, from Brazil, saffron, and other woods; violet and black lakes from logwood; yellow lakes from quercitron, weld, &c.; and all these serve as more or less stable dyes by processes identical with that described for madder—viz., by first fixing the mordant or base, and then forming the lake by immersing the mordanted cloth in the soluble colouring matter.

Coloured mineral substances may be fixed on cotton by a very similar process. The conditions necessary for success are that the coloured substance be insoluble, and that it be formed by the mixture of two or more soluble substances. Chrome yellow and Prussian blue fulfil these conditions, and the greater number of the brilliant yellow and blue dyes on cotton (and by their mixture the greens also) have been produced by fixing these substances. To fix the yellow, the cotton is soaked in a solution of sugar (acetate) of lead, wrung and dried, and then plunged in a solution of bichromate of potash. Double decomposition ensues, and, the insoluble compound formed, yellow chromate of lead is precipitated, and firmly adheres within the cells of the fibre. By substituting acetate of iron and prussiate of potash for the lead salt and bichromate, Prussian blue is produced.

The greater number of the colours on cotton are obtained by these simple processes, but there are others, and one in particular, which require more complex operations. We allude to the Turkey red, or Adrianople red, as it is called by some of the foreign dyers. On examining the very beautiful goods shown by Mr. Steiner, of Accrington, in Class XVIII., the peculiar brilliancy of this colour was appreciated. Nor is it more remarkable for its brilliancy than for its extreme stability and resistance to atmospheric and chemical agencies, for the tedious and intricate operations by which it is produced, and for the mysterious nature of the chemical reactions upon which the success of these operations depends. So greatly is this colour esteemed, that in nearly every European country several manufactories may be found occupied exclusively with its production, and specimens of the products of these were seen in various departments of the Exhibition.

As the name implies, we are indebted to the East for the origin of the process. The peculiar stability of the colouring matter of rubiaceous plants (madder, munjeet, &c.), when combined with fatty matters, appears to have been known in India for many centuries. The processes are said still to remain unchanged among the Indian dyers, so that we may regard the red-dyed cottons in the Indian collection of the Exhibition as examples of the Turkey red process in its infancy. According to the descriptions of Indian processes given to us by Le Joux de Flain, the essential constituents of the Indian dye are buffalo's milk and powder of myrabolans, and an equally essential step in the mode of fixing these is exposure to the sun's rays. The process appears to have undergone some modification before reaching us, as in the earliest recipes we find the fatty matter of the milk replaced by olive oil, and the animal matter, or caseine, by animal excrement. The tannin and the exposure to the sun are still retained, galls replacing myrobalans. According to Persoz, the process was introduced into France by Greek dyers, having been brought by Messrs Fesguet, Goudard, and d'Haristoy, in 1747. It appears to have been introduced into England at a later period; but as the French government, recognising the importance of the process, purchased and published it in 1765, it must have been generally practised soon after this period.

Let us examine the successive steps of this remarkable process. If cotton be steeped in a solution of alum—or, still better, in acetate of alumina—and be then dried, washed, and heated in water containing ground madder, it is found to be dyed of a dull red colour, as we have above remarked. By the aid of soap the colour may be brightened, but it remains very inferior in point of lustre and fixity to the true Turkey red. To obtain this colour the dyer begins by diffusing oil (the inferior olive oils are preferred) through water, by means of an alkali, so as to form an imperfect soap; and by steeping the cloth in the oleaginous mixture. If the cloth so treated be then mordanted with alum and dyed in madder, no colour can be obtained, as the unchanged fatty matter prevents the fixation of the aluminous mordant. But if the cloth be exposed to the sun's rays, or heated in a stove, after impregnation with the oily matter, the latter becomes modified; and if the cotton be afterwards treated with alum and madder, a red of increased stability is obtained, which will bear the brightening processes to a much greater extent than before. If the alternate baths of oil and the exposure to the sun be repeated many times, the result is still superior; it is also found that if common alum be used, galls, or other astringent matter, should be employed, as in the original recipe—the alumina being thereby more effectually fixed on the fibre. It has, moreover, been found that, in order to obtain a full rich colour, the alum bath and madder should be repeated a second time, and that the brightening operations should be conducted at a heat considerably beyond that of boiling water. In the greater number of old recipes the oil baths are repeated at least eight times, but by the improvements of late years these have been reduced to four, while the quantity of oil employed has been reduced in a still greater proportion.

In Persoz's admirable work, "Impression des Tissus," the following process is given as that of one of the best French Turkey red dyers:—

"1. The cotton is saturated with the oil bath as described above.

"2. Piled, and allowed to heat and ferment for twelve hours.

"3. Heated for several hours at a high temperature.

"4 to 6. The above operations are repeated (second oiling).

"7 to 9. Ditto, ditto (third oiling).

"10 to 12. Ditto, ditto (fourth oiling).

"13. The superfluous oil is removed by steeping in an alkaline bath.

"14. Immersed in a solution of alum, mixed with decoction of galls.

"15. Passed in water containing chalk in suspension.

"16. Dyed with madder, the temperature being gradually raised to boiling in three hours.

"17. Well washed, cleaned, and dried.

"18. Passed again in a solution of alum and galls.

"19. Dyed as before with madder.

"20. First clearing—Boiled for eight hours with a solution of soap and pearlash, in a close vessel, under pressure.

"21. Second clearing—Like the first, but with addition of chloride of tin.

"22. Third clearing like the first.

"23. Exposure to the air, and boiling with bran, after which the colour is found to have attained its maximum lustre."

Other recipes differ slightly from this. Many sky-red dyers employ animal excrement in a state of putrescence, mixed with the oil and alkali. This is said to hasten the change which takes place in the constituents of the oil. Others—and among them, it is said, Mr. Steiner, of Accrington, so celebrated for his dye—use muriate of alumina instead of alum; he is also said to use large quantities of blood in the madder dyeing.

Chemistry, which has effected so much for the topical application of dyes on cotton, has done nothing for the Turkey red dyer. Not only has the production of the colour been arrived at independently of the chemist, but he is, we believe, still unable to afford a satisfactory explanation of the chemical changes which take place in the processes.

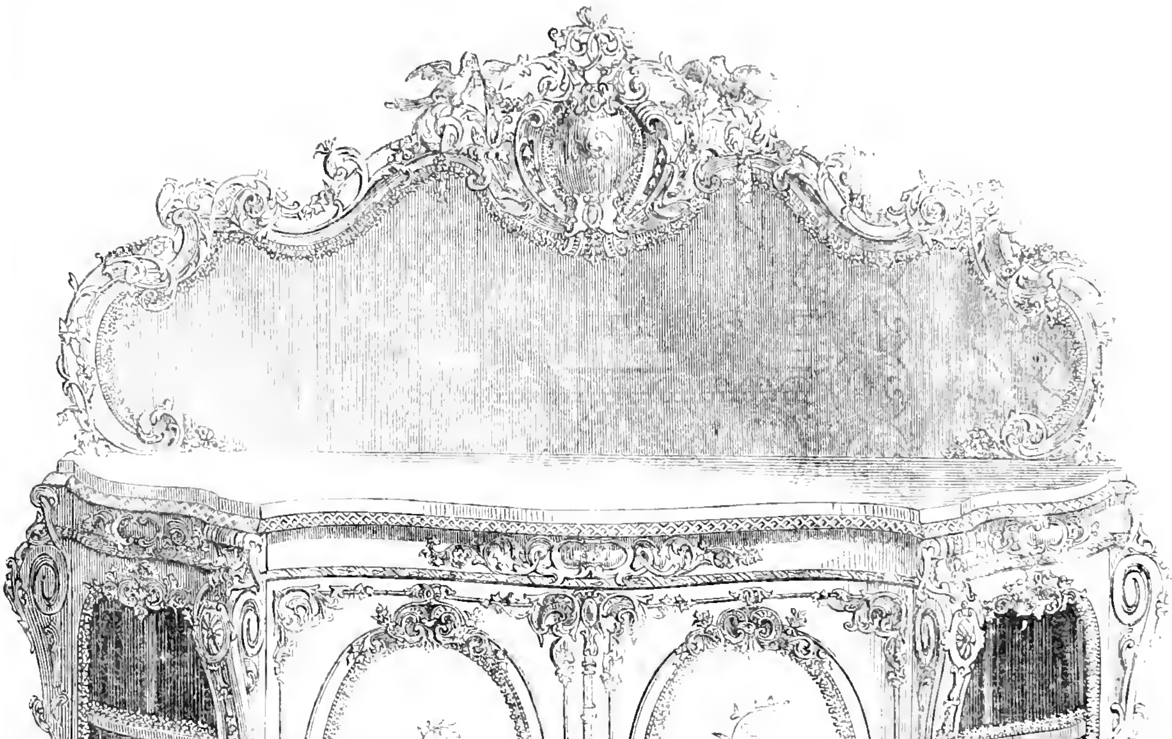
In the British department, Turkey red goods were exhibited by Mr. Steiner, of Accrington; by Messrs. Greenwood and Barnes, Manchester; by Messrs. Monteith and Co., Orr, Ewing, and Co., and Stirling and Sons, Glasgow. The products of the first-named gentlemen occupy the very first rank, and will bear comparison with all others. The yarns of Messrs. Monteith are good, but it appears to us that this firm no longer retain that pre-eminence in their piece-dyed goods for which they were long distinguished. France sustains her reputation in Turkey red dyeing in the person of Mr. Steiner. The three-coloured Turkey red exhibited by him was magnificent. We believe that the peculiar beauty of the red in the splendid chintz furniture exhibited by the firm of Japuis, Paris, is due to the Turkey red process.

Switzerland has long been celebrated for her Turkey red. Beautiful tints, both in yarns and cloth, were shown by Messrs. Ziegler, Blumer, and Jenny, and the brothers Lenmann; and thread, in graduated tints, by Messrs. Miescher and Co.

Belgium—so far behind other European nations in printed cottons, if we may judge from the specimens shown—occupies a high position as regards the Turkey red dye. M. Idiers, of Brussels, showed good specimens. His violets and chocolates struck us as being very superior. In the Austrian department the dyes shown on yarn and cloth by M. Karl Grohman, Lindeman, Bohemia, were equal to the very best in the Exhibition; those of the Imperial dye works of Pordenone, near Venice, were also good.

In the department of the Zollverein, numerous samples of Turkey red yarns were shown. Those of Messrs. Zuis, Luchdorff, Schöll, Wolff, Bruck, Schraidt, Neuhoff, and the Turkey Red Company at Hague show that the German dyers still retain their eminence in this branch of the art. The reds of Neuhoff, and those of the Hague Company, appeared to us to occupy the very first rank.

In Russia Messrs. Pantaleif and Lewis Rabeneck showed Turkey red goods, but they were very inferior to those displayed by the majority of the other exhibitors.



WHITE AND GOLD CABINET.—MR. INGRAM, BIRMINGHAM.

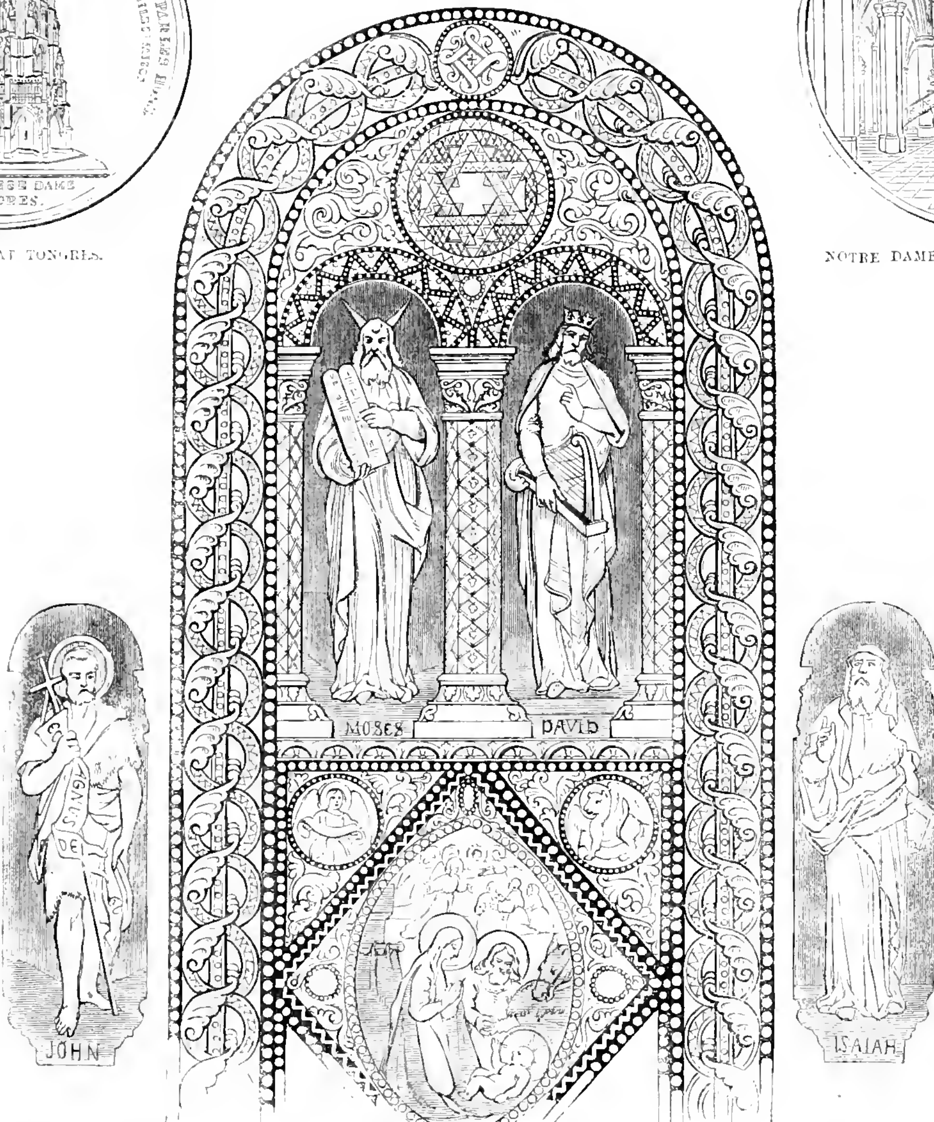
The cabinet of the Louis Quatorze period, manufactured by Ingram, of Birmingham, and exhibited in the Fine Arts Court, was certainly one of the most *récherché* articles of decorative furniture in the Exhibition. It is of white enamel and gold, the panels relieved by the introduction of bird subjects very delicately painted. The recesses at each end are glazed, and at the back is a mirror. The enamelling is upon wood, laid on cold by a new process. The ornamentation, which is rich without being redundant was especially noticeable for its beauty of style and finish.

STAINED WINDOW. BY GIBSON.

THE Norman tracery window, by Gibson, of Newcastle, the upper part of which is engraved below, is a rich specimen of the art. In the central compartment is represented the Nativity; and in the four principal compartments above and below it, two and two, are the four principal prophets, Moses, David, Isaiah, and John the Baptist. The arrangement is simple and effective, and the colouring extremely rich.

NOTRE DAME, AT TONGRES.

NOTRE DAME, AT TONGRES—INTERIOR.



STAINED WINDOW.—GIBSON.

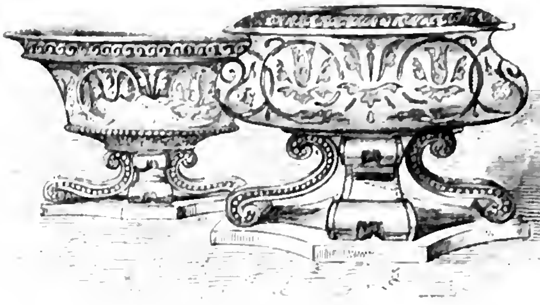
CHURCH MEDALS. BY J. WIENER.

M. WIENER, of Brussels, exhibited a collection of very beautiful medals, representing the principal cathedrals and other public buildings in Belgium. One of these we engraved in a previous number; we now publish four others. In these medals, in the case of religious edifices, the exterior is given on the obverse, and the interior on the reverse of the medal; in the case of other edifices, the reverse is occupied with a ground-plan of the building.

The church of Notre Dame, at Tongres, is a very ancient foundation, which was devastated by the Huns, and rebuilt in the time of Charlemagne. The church of St. Martin's, at Ypres, was founded early in the eleventh century. Both are very fine and interesting relics of antiquity.

ST. MARTIN'S, AT YPRES.

ST. MARTIN'S, AT YPRES—INTERIOR.



SALT-CELLARS.—LIAS AND SON.

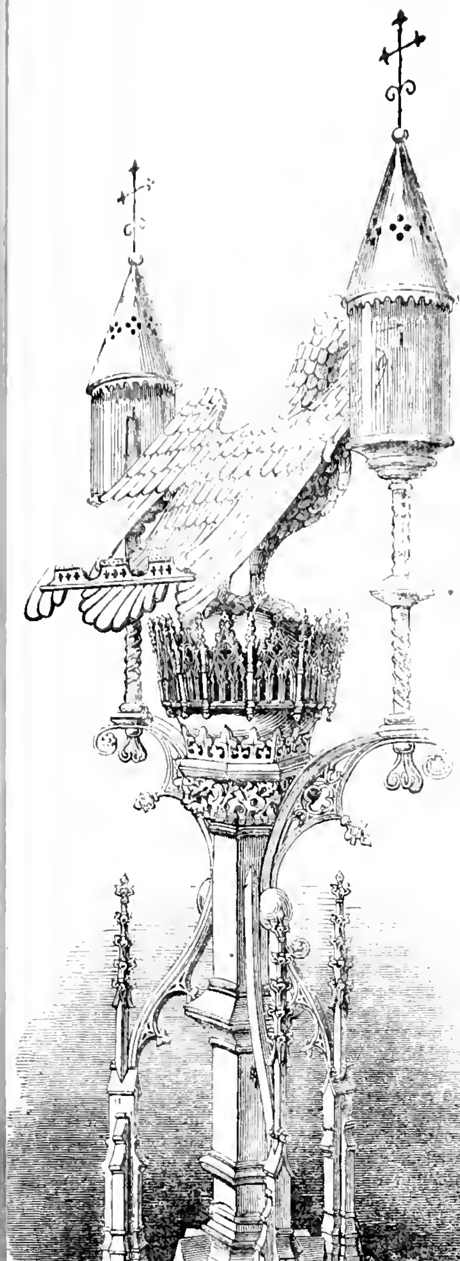
THESE salt-cellars are of a very pretty pattern, rather old fashioned perhaps, but beautifully executed and tastefully engraved.

CENTRE PIECE.—BY LAMBERT AND RAWLINGS.—(SEE P. 352.)

THIS very handsome object is intended to be commemorative of the Great Exhibition of 1851, for which it was produced. At the top is Britannia, with the palm-leaf in one hand; and below are figures emblematic of the four quarters of the globe, presenting the fruits of the earth. Beneath are Tritons and the heads of sea-gods.

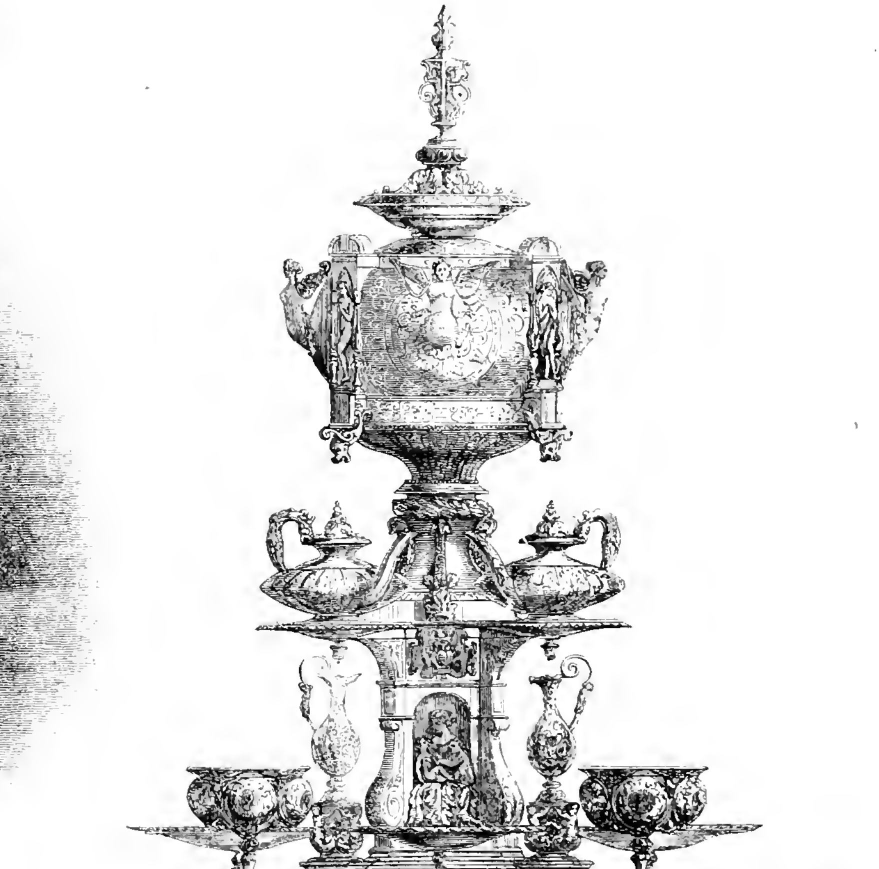
FONTAINE À THÉ.—BY DURAND.

THIS is a very magnificent production—quite a work of fine art—intended as a centre piece for the tea or breakfast table. It is made of silver, in parts oxidised, with enamelling, incrustations, &c. It consists of a standard, of elegant design, supporting a tea-urn with four spouts; and corresponding with them, upon silver plates, are four tea-pots, and an equal number of sugar-basins and cream-jugs. Around the base are places for sixteen or twenty cups. The workmanship throughout is of the most elaborate and costly description.



LECTERN.—COTTINGHAM.

THIS is a large piece of Church furniture, after the ...diæval models, which are still in use in our ...thedrals as reading-desks. The material is brass, ...d the workmanship highly elaborate. It has been ...de for Hereford Cathedral, by Mr. Cottingham, ...o is architect to the Dean and Chapter.



FONTAINE À THÉ.—DURAND.

POTTERS' CLAY.

In our previous article on Porcelain we intimated that to those who desired to make the Great Exhibition a medium of instruction, it was important that the natural production and the finished manufacture should be associated. Following out that idea, we commence our detailed consideration of fictile manufactures at that point, hoping to show the importance of developing to the utmost our great natural resources in this department.

That even so ordinary a production as clay is of great value to a country, is proved by the very striking fact that, until Mr. Cookworthy, of Plymouth, discovered the deposit of kaolin, on the southern side of the Tregonning-hill, near Helstone, in Cornwall, no porcelain was made in England. Cookworthy had obtained possession of some kaolin sent from China by M. D'Entrecolles, and of some from Limoges through the celebrated Réaumur, and industriously examined the decomposed granites—*growan*, as they are provincially called—which occurred in the neighbourhood of some property belonging to his family. He ascertained that the clay which could be artificially separated from this substance possessed all the chemical and physical properties of the clays of France and of China; and he accordingly patented its application for that purpose, established porcelain works at Plymouth, and eventually sold his patent to Mr. Champion of Bristol. Since that time the use of this clay has been most rapidly extending. Cookworthy commenced the preparation of this substance about 1758.

We had in this section about twenty-four exhibitors of clays of various kinds. These illustrate to a certain extent the varieties obtained in the United Kingdom. There were specimens of kaolin, or China clay sent by—

Sir George Hodson, from Sugar-loaf Mountains, Wicklow; Jenkins and Courtney, from Great Bodilla china-stone quarries, St. Austel; Sarah Michell, from St. Austel; J. Phipps, from ditto; Wm. Brown, from ditto; C. Truscott, from ditto; Philip Wheeler and Co., from ditto; E. Martin, from ditto; Rebecca Martin, from Higher Blowing House, St. Austel; W. Phillips, from the Morley Works, Dartmoor.

Pipe Clay and common potter's clay were contributed by—

T. Phippard, from Carey-pits, Wareham; J. Deering, from Middleton, Co. Cork; North Devon Pottery Company, from Annery, near Bideford; N. Burnett, from Black Hedley, near Newcastle; Fale and Co., from the Isle of Purbeck; W. and J. Pike, from ditto.

Brick clay and clay for tiles and drain-pipes were exhibited by—

Lord Enniskillen, from Powerscourt, Ireland; J. Grieve, from Prestonpans; G. King, from Gazeley, near Newmarket; T. Ross, from Charlemont, Hastings; F. Fisher, from Woolpit, Suffolk; T. Simmons, from Birmingham.

In all these varieties the adhesive base is alumina silica, the other ingredients existing in very variable proportions.

The following analysis of a few of the clays employed by the potter will convey some general idea of their composition:—

	Silica.	Alumina.	Lithia.	Lime.	Iron.
Common pottery clay	60	33	—	3	3
Blue ball clay	64	35	—	—	1
Cracking clay	68	31	—	—	1
These clays are usually found united with the coal measures.					
Cornish china stone	68	16	14	—	2
Ditto clay	71	20	2	—	—

The ordinary potter's clay is employed for common earthenware, and always burns either yellow or red according to the quantity of iron it may contain. The blue clay owes its colour to the admixture of carbonaceous matter, and is always very white after burning. This clay varies very much in composition, another sample having given—silica, 46; alumina, 38. "Cracking clay" was first used by the Wedgwoods, and from the peculiarity to which it owes its name it could only be used in combination with a large quantity of flint, as in the Wedgwood stone-ware.

The Cornish and Devonshire china clay has been analysed at the Sèvres establishment by Brogniart, who has given the following result as compared with the best French kaolin of St. Yrieix:—

	Rocky residue.	Lime, Magnesia, potash.	Silica, with Alumina. Combined.	Silica, with Alumina. Not combined.	Alumina.
Cornwall	19·6	0·60	1·27	43·3	24·6
Devonshire	4·30	1·35	10·19	34·07	36·81
St. Yrieix	9·7	1·33	10·98	31·09	34·65

These clays which were exhibited were, with two exceptions, from the neighbourhood of St. Austel, in Cornwall; one of the exceptions being a specimen from the Earl of Morley's property, in Devonshire, and the other from the county of Wicklow. The conditions under which they occur are precisely similar, and the mode of preparation is the same.

The decomposed granite, which contains much quartz, and usually some mica, is exposed on an inclined plane to a fall of water, which washes it down to a trench, whence it is conducted to "catch-pits." The quartz and mica are principally retained in the first pit, the water flowing over into the second, carrying with it only the lighter particles; there is usually a third "catch-pit," which receives the water charged with the fine clay only, the result of the decomposition of the felspar of the granite. There the clay sediment is allowed to settle, the supernatant water being drawn of from time to time as it becomes clear. By repeating this process many times the receiver becomes full of clay; this is allowed to dry, so as to admit of being cut out into cubical or prismatic masses of sides of abou one foot, which are carried to a roofed building and placed on frames to dry. When considered to be sufficiently dry, the masses are carefully scraped, packed in casks, and sent off to the potteries. The processes o preparing and cutting out the clay is usually performed by men and boys women and girls being employed to scrape the dry cubes and prepare them for packing. During the summer months the China clay-works on the St. Austel moors, and in St. Stephen's, present a scene of active industry.

It appears that about 1,757 tons of this clay were exported from Charles town, a port near St. Austel, to the potteries in 1809. In 1826 the exper had increased to 7,090 tons from Charlestown, 400 tons from Pentuan, 3(from Porthleven, and 18 tons from St. Michael's Mount. Of late years the demand has greatly increased, and china clay is not now used in the manu facture of porcelain only, but many thousand tons are annually employed in calico bleaching establishments and in paper manufactories, the objec being in both cases to give an artificial body to these substances. At leas 20,000 tons of the Cornish and Devonshire china clays are now annually prepared.

In addition to this artificially prepared china clay, an inferior kind i raised at Bovey Tracey, probably about 25,000 tons annually. A sem decomposed granite—which is of the same character as the clay, but in less advanced state of disintegration—is largely worked. It is quarried i large quantities in the parish of St. Stephen, on Dartmoor, and in sever other of the primary districts. This china stone is principally employed i the potteries as a glaze; the alkali which is present assists the fusion of th mass into a glass, which is very thoroughly spread over the biscuit war and, indeed, interpenetrates it.

The other clays are found in beds in which they have been graduall deposited; they undergo no preparation, and their qualities vary with almos every change of geological conditions. The processes adopted in th potteries to prepare these clays for the use of the potter, have been referre to in previous articles on pottery and porcelain.

ARMS AND ARMOUR.

In treating of arms and armour, a very natural distinction exists betwee arms used for close quarters and arms employed at a distance—th latter being usually denominated projectiles. Now the subject of arms to l employed at close quarters is far less interesting than the subject of pr jectiles, as indicative of a less refined, less intellectual condition of man.

Treating the subject according to its development, we have first remark the carved clubs presented to the Exhibition from Australia, Ne Zealand, and certain other equally civilised lands. Clubs are, perhap the simplest form of all offensive arms, and one might suppose they wou have vanished from the equipment of warriors who had the means acquiring cutting and stabbing weapons. We find, however, the rever to be the case; war maces continued to be used by knights and the men-at-arms up to the very last days of chivalry, and their disuse ma be said to be coeval with the general introduction of fire-arms and th abandonment of coats of mail. Indeed, mere cutting or stabbing weapo were of but little use against the defensive armour of men-at-arms. Th lance—the favourite weapon of Norman chivalry—should rather be r garded as an instrument for unhorsing a rider than for penetrating th well-tempered metal of his poitrinal; against such a tortoise-like defen the battle-mace was possibly the best weapon of attack that could be use though, generally speaking, the death stroke was usually given by th dagger, or *misericorde*, which, so soon as the knight was unhorsed, an sprawling on the ground—being gently insinuated into the undefende space in the neck, where the helmet and the corslet joined—completed th work of death.

The use of the battle-mace was extended, too, by reasons of a religio kind. The clergy were not limited in times of chivalry, as now, to c battle with their tongues. They turned manfully out in field of battle t fight like other men. They were not permitted however, to shed bloo and so the lance, and sword, and dagger, or *misericorde*, were to the unholy weapons. They were limited to the use of the battle-mace—a instrument which, we have not the least difficulty in understanding, deal when wielded by their brawny arms, blows of a truly orthodox kind.

Whilst on the subject of defensive armour, we are sorry to destroy th romantic idea of danger which ladies are so wont to associate with th idea of the ancient knights. But the heavy defensive armour of those warrio reduced their immediate chances of death far below the limits of prob bility; and no sooner was gunpowder applied to the purposes of warfar than those brave men turned themselves into human tortoises of steel an brass, so great was their fear. In several battles about this time not single knight was slain. When unhorsed it was difficult to penetrate th joints of their armour by the *misericorde*, and at the battle of Fernoui under Charles VIII., a number of Italian knights having been unhorsed could only be killed after they had been broken up like so many lobster with woodcutters' axes. This circumstance justifies the remark of James I that defensive armour was a double protection, preventing the beare at the same time from being injured, and from injuring others.

It is curious to mark the effect which the general introduction of fire-arms produced on the system of defensive armour. At first, protection was sought in increased thickness of metal plates—but the force of bullets being so great in comparison with the power of metals to resist, defensive armour was at length thrown away altogether, until re-introduced by Napoleon in the organisation of his celebrated cuirassiers. Our heavy troops, at the period of the battle of Waterloo, had no defensive armour, as is well known; nevertheless, they proved more than a match for their breastplated antagonists; and when, subsequently, the addition of breast-plates was proposed, and a guardsman being questioned concerning his notions on the improvement before a committee of the Lower House, was asked, "How he should like to be clothed if he had to do another day's work of the same kind," very naïvely answered, "That he thought he should prefer being in his shirt sleeves."

Defensive armour has, however, become pretty general for all European heavy cavalry. That it proves a defence against sword and lance, there can be no doubt; but against the modern improvements in fire arms, concerning which we shall have to treat by-and-by, it will be henceforth totally unavailing.

Whilst on the subject of weapons employed by the chivalry of ancient times, we must not forget to mention the battle-axe and the double-handed sword. The battle-axe still lingers in the East, and specimens were found amongst the Indian contributions to the Exhibition; but the two-handed sword is now quite obsolete—banished from the list of weapons of war in favour of swords of lighter make.

The Exhibition was exceedingly rich in the department of swords. Beautiful specimens were to be seen in the departments of India, Turkey, France, and Spain, in addition to those of more barbarous make.

No one now thinks of making a sword of any other material than steel; but a great deal of sanguinary work has been done by swords of copper, bronze, iron, and even wood. Copper swords have been found in Ireland; and bronze swords were almost exclusively employed by the Greeks during what is called the heroic age. Homer rarely mentions iron; he calls the Greeks by the general epithet, "brass-coated;" and the word translated by Pope "smith," is in the original χαλκεὺς, worker in bronze; and even when the metal employed was iron (σίδηρος), the artificer is still called the same, a brazier, proving that the two trades were then identical. Nevertheless, iron, and even steel, were known to the Greeks in Homer's time, for he describes the method of tempering a hatchet by dipping it when hot into cold water. This plan of tempering only applies to iron and steel.

Nine hundred years after the epoch of the siege of Troy, steel must have been exceedingly rare among the Greeks, as is evidenced by the fact of the Indian chief giving, as a valuable present to Alexander, about thirty pounds weight of this metal. We have no evidence that the Romans, even at the earliest periods of their history, ever used any other metal than iron or steel for their cutting weapons; and the materials for fabricating them they probably derived from Elba or Spain. Nevertheless, for some reason or other, bronze was commonly used by the Romans for non-warlike cutting instruments, down, at least, to the period of the first century of the Christian era. In Herculaneum and Pompeii, those tomb-like records of ancient arts and manners, even surgical instruments have been discovered, formed of bronze.

Turning our attention to Asiatic nations, we do not find any record of the employment of bronze for the manufacture of cutting instruments, Wootz, or Indian steel, having been there employed from the most remote period.

Some of the semi-barbarous tribes, who so frequently did battle with the Roman troops, must have been provided with weapons of a very rude description. The Gauls used iron swords of such bad temper that, according to Polybius, they had to be straightened under foot after the exchange of every three or four blows: and in 222 B.C. an army of Insubrian Gauls having entered the north of Italy, were defeated by the Romans chiefly from this circumstance.

The sword is now, amongst all civilised nations, restricted to the use of cavalry; being found incompatible with the close order in which infantry should march to the attack. The Roman legionary soldiers fought with the sword, as is well known, but their weapon was very short—more like a heavy dagger than a sword, and required no great space for the performance of its evolutions. Among modern tribes, the Highlanders relied greatly upon the sword as an infantry weapon; and a great deal has been said about the good service done by our allies, the Ghoorkas, in northern India, with their diminutive swords. Properly speaking, however, these latter weapons are not so much swords as bill-hooks, and there can be no question that, viewed in all its bearings, the sword is only adapted as a cavalry weapon.

The blades of many of the swords and daggers in the Oriental department were observed to be covered with curious wavy patterns, very similar to those frequently to be seen on the barrels of fowling-pieces, and which, in the latter position, is denominated the Damascus twist. These wavy patterns on Oriental sword blades are considered so great a beauty, and are indicative of so fine a steel, that many endeavours to successfully imitate the appearance have been made both in England and abroad. Hitherto, however, these attempts have been unsuccessful, and the prevailing idea seems now to be, that the Damascus sword pattern is a casualty altogether due to that mottled appearance of the Wootz iron, from which the steel that entered into these swords was prepared, and to the imperfect means of hammering [illegible] artificers [illegible].

Everybody has heard of the famed blades of T[illegible] some remarkably beautiful specimens of this manufacture [illegible] division of the Exhibition, (one of which we engraved in N[illegible] Unlike many other branches of industrial art in Spain, the [illegible] of sword-blades has not languished. At the present day [illegible] turned out of the arsenal of Toledo as good as, if not better [illegible] former period. The two specimens of Toledo blades, which [illegible] circular coil within their serpent like sheath, are [illegible] good steel, and artistic skill, and the cavalry swords are [illegible] We wonder that there was not exhibited amongst the T[illegible] example of the bull-fighting sword, which [illegible] make, being slightly curved on the flat, and [illegible]

Whilst on the subject of swords, it will be as well to remark that steel, of which such frequent mention has been made, is merely a compound of iron with carbon, usually about the proportion of one to one and a half per cent. Certain specimens of steel contain, moreover, a notable portion of alumina and of silica.

Carbon and the diamond are, so far as chemical composition goes, one and the same; and hence it is, that if a hole be drilled in a rod of iron, a diamond inserted, plugged up with another bit of iron, and the whole exposed to fire, the diamond will disappear, and the iron will become steel. We make our steel by the far less expensive mode of heating iron bars with charcoal: but the celebrated Polish traveller, Count R[illegible], informs us that he had seen an Arabic MS. in which it was stated that the Turks in ancient times improved their sword blades by sprinkling them while red hot with diamond and ruby dust, and beating them with a mallet. The diamond would yield carbon, and the ruby alumina, and thus the blades would acquire the properties of very good steel: but people are less extravagant in these calculating days.

The method of forming sword blades, as at present followed in England, is very simple. The manufacture is almost exclusively confined to Birmingham; and the steel of which the swords are made comes from Sheffield. Cast steel is the quality employed, and each piece is sufficient to make two blades. The operation is commenced by drawing out each end, by forging, to about half the thickness of the bar, leaving a few inches in the centre the original size, each end in its turn serving as a handle to hold it by while forging the other. Eventually the centre piece is cut through and fastened, by welding, to the piece of soft iron which enters the sword hilt, and which is called the tang. The blade is now raised to a bright red heat, and plunged into cold water, edge foremost, by a cutting movement, which is immediately changed to a perpendicular one. In this state the blade is quite brittle, and very often bent. It has now to be passed through the forge again until a certain colour is acquired, which practice alone can indicate; and in this state of the operation it is set straight by the eye. Lastly, it is ground, polished, and embossed.

This slight sketch will suffice for our notice of swords, and now, before proceeding to the subject of projectile arms, it remains to pass a few remarks on the bayonet. This weapon, by which the musket is connected with the pike, was of French origin, having been originally manufactured at Bayonne, and hence its name. At first it was merely a dagger with a handle made to fit into the musket barrel when discharged. Eventually the present fashion of attaching it by a socket on one side of the muzzle was adopted, the great advantage of which it is unnecessary to point out.

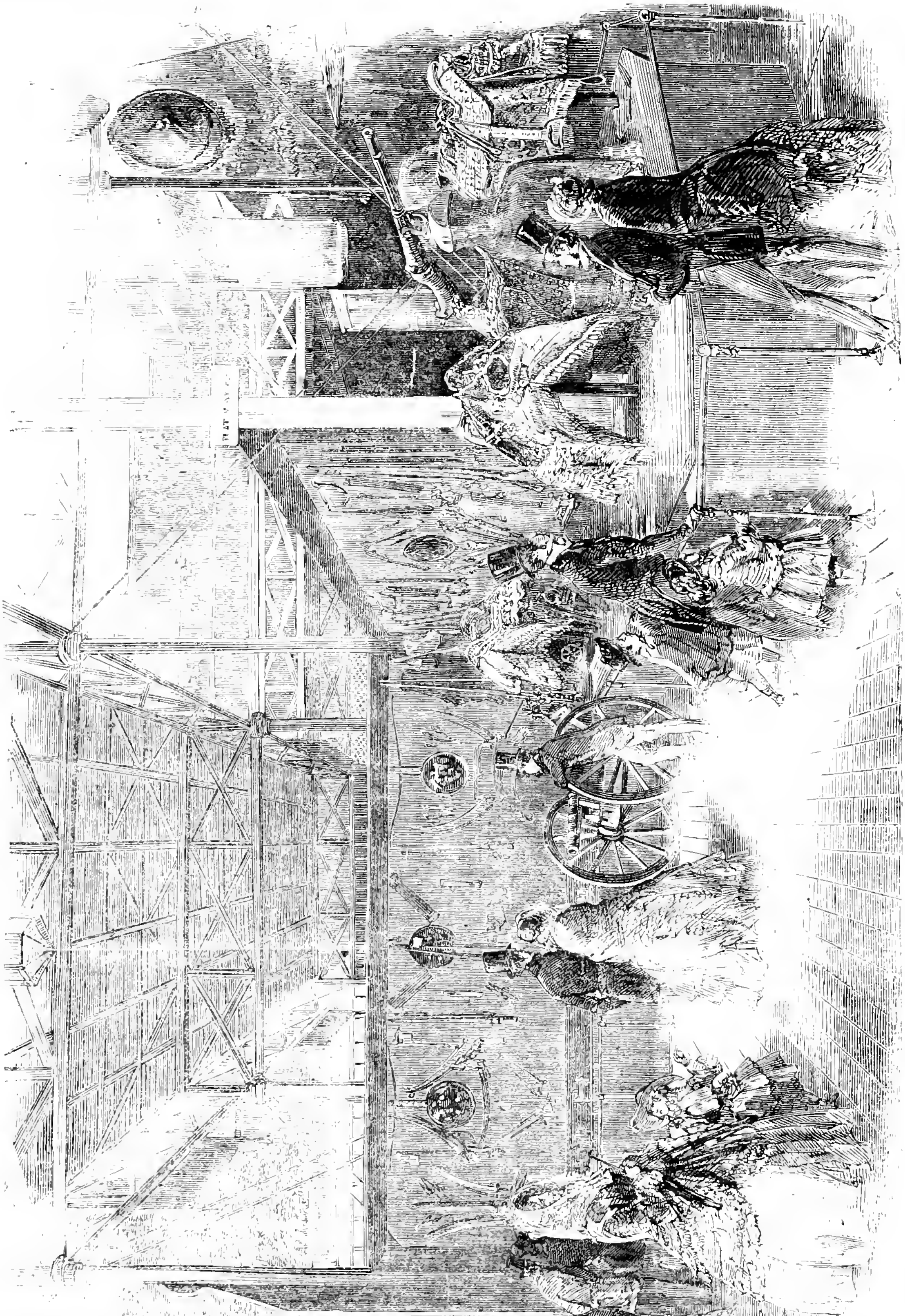
Bows and Arrows.—We now come to describe the Projectile Weapons in the Great Exhibition; and our first remarks shall be directed towards the various bows which are there found.

Most nations, civilised or savage, have, at one period or another of their history, used the bow; and we, amongst all toxopholites, have, perhaps, been the most justly celebrated. In the Great Exhibition were to be seen many bows of different kinds.

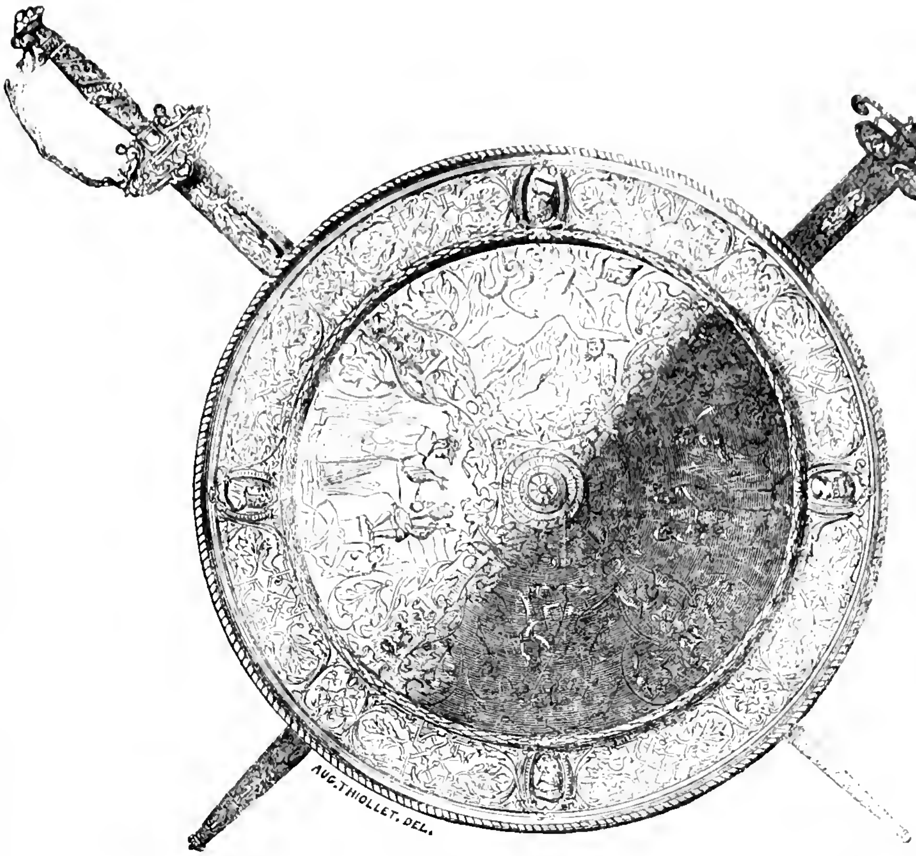
In the Indian department the visitor saw many specimens of bows—some rude enough, and long, the caricature of the shape now used by modern toxopholites; others short, curved, and highly ornamented. The first merit no description; but the second kind should be pointed out as the true Scythian bow, the instrument which has been employed from time immemorial by all the asiatic tribes from Persia to the West. Its construction is peculiar; the foundation of the instrument is wood; but it is not from the wood that the bow derives its elasticity. This is given by animal tendons laid on the wood wet, bound tightly down, and allowed to dry. This kind of bow is very short, but the arrows are taper and long. In fact, the Scythian bow, though short in appearance, yet derives from its double curve a large expansive and contractile play.

Returning to the history of the bow, it is unnecessary to inform the reader that it is mentioned in Scripture, even at so early a period as is represented in the book of Genesis, where it is said of Ishmael, that the "Lord was with the lad, and he grew and dwelt in the wilderness and became an archer." The overthrow of Saul, it will be remembered, was particularly owing to the Philistine archers; and David commanded that the children of Judah should be taught the use of the bow.

The Greeks had a tradition that the bow was invented by Apollo, who communicated the use of it to the inhabitants of Crete; hence, in later times, the Cretan archers were thought superior to all others. According to some authorities among the Greeks, Perses, the son of Perseus, had the credit of discovering the use of the bow; others attributed this honour to

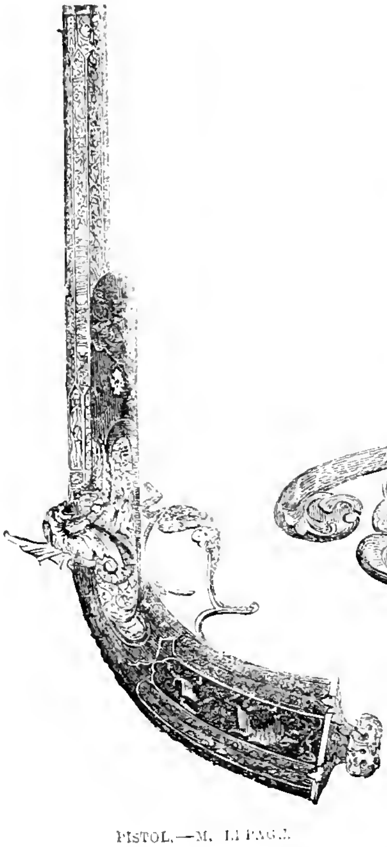


ARMS, &c. IN THE EAST INDIAN DEPARTMENT.

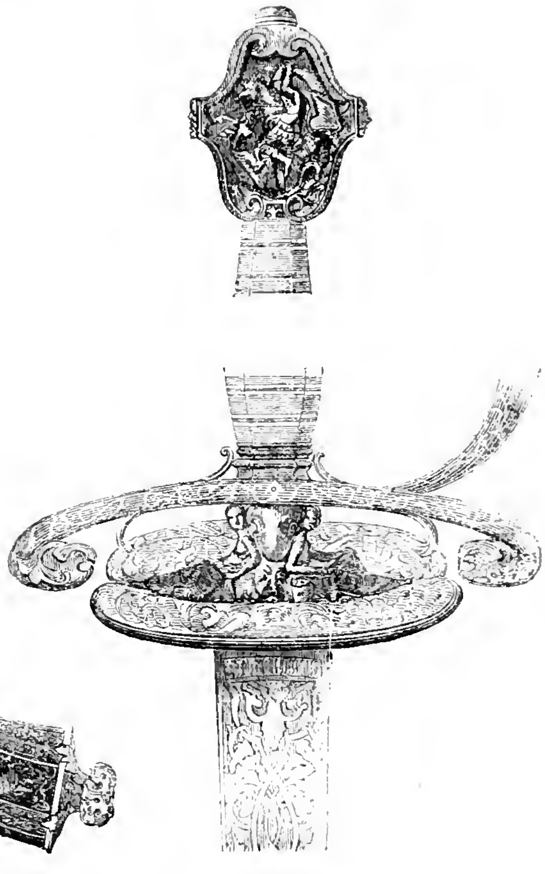


SHIELD AND ARMS.—M. LEPAGE.

SWORD HANDLE.—DELACOUR.



PISTOL.—M. LEPAGE.



SWORD HANDLE.—M. LEPAGE.

Scythes, the son of Jupiter. All these traditions demonstrate the antiquity of the bow.

The Grecian bows were usually made of wood, but still commonly enough of horn—or rather two horns joined together by a middle piece, which served as a handle. The latter form of bow presented a beautiful combination of curve and straight line, which a highly artistic people preferred to transmit to posterity in their sculpture. It is the real classic bow—the instrument with which Cupid is always painted, but which becomes a very troublesome instrument to make out of any other element than horn.

There were various methods of using the bow. The ancient Persians drew the string towards the ear, as was always the practice of the English, and as is employed by British toxopholites at the present day. The Greeks, however, drew the bowstring towards the breast—and represented the Amazons as doing the same. The tradition of the Amazons cutting off the right breast, in order to give greater freedom in drawing the bowstring, is familiar to all.

With the Romans the bow was never a favourite weapon. Their daring soldiers always preferred the hand-to-hand pilum and doubly-cutting sword.

Until the period of the second Punic war, the Roman armies were devoid of archers, save those who came with the auxiliary troops; and, though subsequently to the period in question, bows and arrows were more employed by this people, yet, so far as we can learn, their use was limited to Orientals in Roman pay. Up to the period of the death of Clovis, A. D. 514, the French did not employ the bow in their military service; but there is abundant testimony to prove that its use was general in France in the reign of Charlemagne, who flourished in the beginning of the eighth century.

The fame of the bow as an old English military weapon is proverbial, though its antiquity in this capacity is not so great as many are disposed to believe. For the purposes of amusement or the chase, the bow was undoubtedly employed both by Anglo-Saxons and Danes, having been derived most probably from Scandinavia; but the military employment of the bow in England dates from the conquest by the Normans. Harold, it is well known, was shot by a Norman arrow; but no mention is made of archers on the side of the Saxons. The Saxon bow, indeed, as we have it represented in a MS. of the tenth century, must have been altogether unadapted for military purposes. Its size was that of a mere toy, and the string, instead of being attached to each end, was allowed to play from two points some considerable distance towards the middle.

Although we know that the battle of Hastings was mainly determined by the Norman archers, we are not informed whether the bows employed were cross-bows—such as are at present used for shooting rooks, being mounted on a stock like a gun, and bent and discharged by mechanical means—or long bows. Grose, the antiquarian, who afforded such a theme of innocent raillery to Burns, argued the long bow to have been the Norman weapon; others, and, we think, with much greater show of probability, imagine testimony to be in favour of the cross-bow—an instrument which was subsequently employed by France and Continental nations in preference to the long bow, which latter became eventually the national weapon of the English.

Guns and Gunpowder.—Not to pursue the history of archery further, we now proceed to notice the invention of fire-arms, by which the bow and other old-fashioned projectile weapons have been superseded. And first, a few words about gunpowder, without which our observations upon this subject would be incomplete.

Polydore Virgil and Thevet attribute the invention of gunpowder to a monk named Constantine Anclzen, a chemist of some celebrity in his time. Others maintain that it was discovered by Bartholdus Schwartz, in the year 1320. There is not the least difficulty, however, in referring a knowledge of gunpowder to an earlier date than the above, our own countryman, Roger Bacon, having distinctly mentioned it in 1267. He describes its composition, specifies many of its properties, and enumerates its explosive powers, as a means of destroying animals. He states that when inflamed it makes a sound like thunder, and a flash like lightning, but exceeding both in sound and brightness. He goes on to speculate on the probability of its employment by Gideon when he defeated the Midianites with three hundred men, as described in the seventh chapter of Judges. We English are in the habit of saying that Bacon "invented" gunpowder, whereas a slight examination of his writings suffices to disprove this notion. So far from laying claim to the discovery of gunpowder, Bacon distinctly mentions it as a substance well known in his time; he even goes on to tell us how to make a cracker.

It is quite clear, then, that the discovery of gunpowder dates further back than the time of Bacon; and M. Dutens, a gentleman who has written a book to prove that the ancients knew many things which are commonly attributed to the moderns, imagines that Bacon must have derived his knowledge from Marcus Græcus, who lived about the end of the eighth century. This author not only had a general knowledge of the properties of gunpowder, but he gives a tolerably precise description of the method of manufacturing it.

Various documents could be mentioned to prove that gunpowder was known in India at periods of very great antiquity, and collateral testimony exists in favour of its being known also to the Chinese. Citizen Langlès, in a memoir read before the French Institute, contends that gunpowder was conveyed to Europe by the Arabs, on the return of the Crusaders, and says that the former people employed it at the siege of Mecca, in 6 The Arabs, he says, derived it from the Indians. Now, at the time wl Roger Bacon lived, the Arab portion of Spain was the favoured seat literature and art; and as we know he travelled in Spain and was famil with Arabic, it does not seem improbable that he derived his knowle of gunpowder from some treatise in one of the Saracen libraries. T supposition, at any rate, is just as probable as that he read the treatise Marcus Græcus; indeed, there exists at this day, in the Escurial, an Ara treatise on gunpowder, written in the year 1249.

If we are to believe Philostratus, (who, by the way, had a very l habit of telling untruths), gunpowder was not only known to the nati of India in the time of Alexander's conquests, but even the application gunpowder to the purposes of fire-arms. Referring to the Oxydracæ, says, "Those truly wise men dwell between the Hypharis and Gang their country Alexander never entered, deterred not by fear of the in bitants, but, as I suppose, by religious motives, for, had he passed Hypharis, he might doubtless have made himself master of all the coun round them; but their cities he never could have taken, though he l led a thousand such as Ajax to the assault; for they come not out to field to fight those who attack them; but those holy men, beloved by gods, overthrew their enemies with tempests and thunderbolts shot fr the walls. It is said that the Egyptian Hercules and Bacchus, when t overran India, invaded this people also; and having prepared warl engines, attempted to conquer them; they in the meantime made show of resistance, appearing perfectly quiet and secure; but upon enemy's near approach, they were repulsed with storms of lightning, thunderbolts hurled upon them from above." It is true that Philostra was a story-teller in more senses than one, but, taken in connexion with fact that pyrotechny has been cultivated in India and China from t immemorial, the narration just quoted is at any rate probable.

Thus, notwithstanding our examinations, we find that the first o nator of gunpowder is still unknown. It is quite clear that Bacon did discover it, neither did Schwartz, neither did Marcus Græcus; and endeavours to arrive at the individual to whom this honour should attributed have only had the effect of carrying us back into the my records of Asia, where, if we are to trust our documents, gunpowder been known from time immemorial. This much is certain, its first applica to artillery in Europe dates from about the beginning of the fourth cent

Having stated thus much about gunpowder, it is time for us to di our attention to guns: and, first of all, let us take a glance at the can in the Exhibition. Conspicuous for these engines amongst all the associ nations are the Belgians, who sent us from Liège cannons of diffe weight and bores, all of them demonstrating the high amount of excell to which our neighbours have arrived in making heavy castings. T Belgian guns, although good specimens, afford very little scope for gen remark; indeed, a cannon is so simple a weapon, that very little ca said about its construction or properties. At the present time, can are almost invariably made either of cast-iron or a sort of brass ter gun-metal; but before the arts of casting and boring were brought to t present perfection, cannons were made of bars of wrought-iron, confi together with hoops: indeed, in many cases, even this amount of const tive skill was too great for the cannon-maker, who contented himself using hollow wooden trunks, and, on some occasions, coils of rope. As wrought-iron, the attempt has often been made to weld it into cann but, so far as cannons of largest size are concerned, the attempt has b invariably unsuccessful, for the reason that our means of welding s large masses of iron are imperfect. Some years ago, a large wrought-i cannon burst on board of an American ship-of-war, the second or third t of firing.

For small cannons wrought-iron answers well enough, but the pro of manufacture is laborious, and the gun, when made, is not better t one made of brass. In the English service, small cannons, such as fi pieces, are usually made of brass, but larger cannon of iron. In Fra however, it is by no means uncommon for battering cannon to be mad the latter material. The advantages of a brass cannon are lightness strength: the disadvantages, softness of material—causing the touch-l to enlarge, and the bore of the gun to be abraded; pliability, which destr the straightness of axis, and causes the muzzle, after a certain time to dro and, lastly, a dull, heavy, painful noise on being discharged. In the Eng service (we cannot answer for that of other nations), the balls intended t fired out of brass guns are usually fixed in a wooden cup or basket, by wh means their contact with the brass barrel is prevented, and their abrad influence is diminished.

Large fire-arms may be divided into cannons, mortars, howitzers, rockets. Cannons are generally intended for the purpose of projecting s balls; but, of late years, the practice of employing them for shells become prevalent. The bore of a cannon is of the same size through but mortars, howitzers, and carronades are *chambered*, or, in other wo are smaller in the part which receives their charge of powder than in rest of their bore—a contrivance which permits the charge to be igni more centrally than otherwise would have been possible, and thus enal the powder to explode with increased effect. The chambering of la fire-arms is analogous to the patent breeching of portable guns—a con vance which we shall speak of presently. The theory of the propulsio fire-arms missiles is almost too simple for remark; the vast force of th projectiles being dependent on the sudden evolution of an immense volu of gas, generated by the combustion of gunpowder. Long after the discov

f cannons, the flight of the projectiles was involved in the greatest ystery—was considered to follow a different law from that regulating the ight of all other bodies; and anterior to the period of Tartaglia, the enetian artillerists universally believed that the first part of the flight of annon-balls was in an absolutely straight line. The fallacy of this opinion artaglia demonstrated by showing that even from the first instant of ischarge fire-arm missiles described a curve; and soon after, Galileo proved his curve to be derived from a parabola. We say *derived* from a parabola, ecause, contrary to what school books tell us on this point, the curve is nly a true parabola in vacuo. If the cannon ball be fired at slow velocities, he curve does not largely vary from the parabolic form, and the parabolic heory may be applied with advantage as a basis of calculation to the law of heir flight; but if they be projected at high velocities, the parabolic theory s useless.

The Belgians gave us a sample of their ingenuity in making bomb-shells; he Russians did the same. These terrible projectiles, although very simple o look at, require great delicacy in their manufacture. They must be cast ithout any flaws, and must possess an equal thickness in every part. To etermine the absence of flaws, each bomb-shell is proved by forcing air nto it with bellows whilst under water; and equality of thickness is proved y gauging. Shells are nearly filled with gunpowder, into which is driven fusee, timed to burn a given number of seconds, and to explode the charge ithin the shell when the latter shall have arrived at the desired mark.

Formerly, shells were exclusively shot out of mortars and howitzers, but hey are now very generally shot out of long guns. The Shrapnell-shell s similar to the bomb-shells we have been describing, but much thinner; nd, instead of mere gunpowder, it contains a mixture of gunpowder and mall iron balls, the former just enough to burst the shell and scatter the alls. The Shrapnell-shell is intended for doing execution at distances eyond the range of canister and grape-shot, both of which scatter immeditely they leave the gun. The largest sized bomb-shell used in our service as a diameter of thirteen inches; beyond which size they may be made, ut the mortars for shooting them would be not only unwieldy, but such eavy castings would be generally imperfect.

Carronades are short, light, large-bored cannons, made to be charged with much smaller quantities of powder than other guns of equal bore, and hiefly designed for the upper decks of ships, where the weight of ordinary arge cannons would be a disadvantage.

Congreve rockets are only modifications of the common sky-rockets which, far from having been applied to warlike uses by Sir W. Congreve for he first time, have been used for that purpose by the Chinese from time immemorial. This fact is testified by Sir William Congreve himself, in his reatise on rocket practice.

REFERENCE TO ENGRAVINGS.

In one of the bays of the East Indian Department the counters on each ide were entirely occupied with a splendid assortment of arms and military quipments, comprising magnificent matchlocks (inlaid in silver or mounted with gold), blunderbuss-like guns, used by our fierce enemies the Sikhs, and rass swivels, used by Malay prahus, with mortars from Lahore, and canons from Mysore, swords and sabres, and spears, of all shapes and sorts—ll keen, glittering, and sharp weapons—used by the Scindians and the ikhs, the Mahrattas and the Burmese; some with blades of dark steel, and thers with light, inlaid with gold; some with hilts entwined with pearls, r exquisitely enamelled, or otherwise beautifully decorated. Nor was it nly the weapons of modern warfare that were here, but those also which llustrate the mediæval history of India, and which may have been wielded y the chivalry of the East amidst the gleaming battle-hosts of Nadir Shah r Ghengis Khan. Here, in short, were to be seen the armouries alike of Tippoo and Tamerlane. Here hung the glittering scimitar and tapering ance. Here we found the small circular shields suited to a former age of warfare; and here were suspended the fine chain-worked coats of armour, lmost as flexible and light and yielding to the form as the beautiful coats f linen or silk of similar shape exhibited in the cross avenue of the ompartment opposite, reminding one of the chain armour of our ancient Norman chivalry. Here, again, were the bows and arrows, and the javelin also recalling the ideas of our own early military history), arranged tastefully in circles, presenting all around a terrible close array of keen-looking oints. Here likewise was the battle-axe—most beautifully inlaid—and a uperb suit of steel armour inlaid with gold, together with a shield of deerkin, transparent and with enamelled bosses. And lastly, here were some urious specimens of most murderous ingenuity: such as a shield, with gold osses, every boss concealing a pistol; a double sword dividing at pleasure nto two longitudinal or lateral sections, each constituting a complete veapon; and strange conical caps, having round them sharp-edged *discs* of rass, hurled most dexterously and dangerously by some tribes as weapons f offence—little knives and daggers being very engagingly stuck all round, nd giving an appearance to the whole far less graceful than grim.

The French gunmakers and armourers pay great attention to the decoative department of their business, such as sword handles, fancy pistols, nd so forth, which they really render very beautiful, almost inviting in ppearance.

M. Monitier Lepage exhibited some remarkably fine armour and arms, rnamented in the richest manner with reliefs, done by the process of unching, known as *répoussé* workmanship, as well as by embossing, chasing, nd engraving, of which we have engraved a few specimens.

The sword handle, richly ornamented with bronze and or-molu, by M. Delacour, is a handsome specimen of decorative workmanship.

FOREIGN AND COLONIAL DEPARTMENT.

FRANCE, No. III. FRENCH DECORATIVE ART.

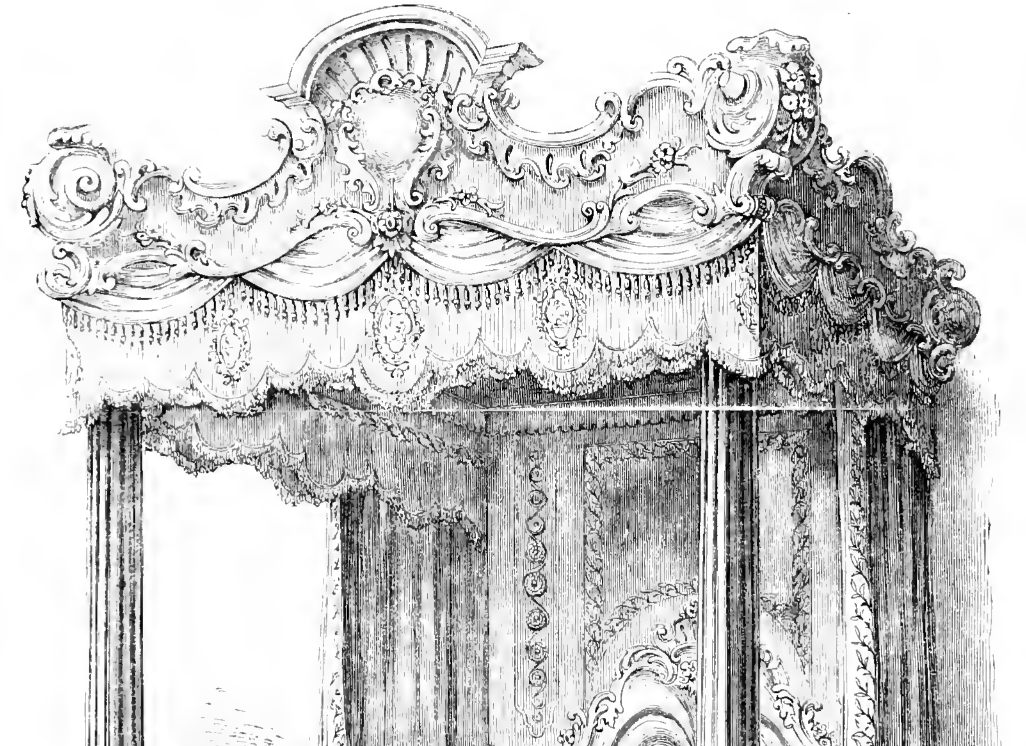
WHEN walking through the courts and galleries of the Exhibition, we found ourselves surrounded on every hand by evidences of the intimate relation subsisting between the growth of art and the [illegible] of the qualities which stamp the character and affirm the position of nations in history. France reveals an activity of [illegible] highly developed social and political vitality [illegible] in every article, for the use even of the poorest [illegible] of those sentiments which make taste a humble luxury for all, if not an indispensable accessory to the enjoyment of life. Throughout the French compartment no one could fail to notice the Protean shapes and [illegible] in which the same objects presented themselves. One Sèvres vase was Oriental: another was antique; a third recalled the breakfast-table of Mesdames Pompadour or Du Barri: a fourth imitates the Majolica of Guid' Ubaldo of Urbino; a fifth recalled the tazze of Jean Courtois or Lizard. One fragment of ornament was Pompeian, another pure Italian, another Louis Quinze; and thus the flowers of all time are combined in the modern Parisian bouquet. All this variety of style—springing rather from impressions and floating recollections than from any desire to copy with servility—bears testimony to the spread of a popular knowledge of the history of art; and it could only become universal in a country in which models of art had been popularised through every imaginable variety of graphic reproduction. So long as France is likely to retain her title of "Queen of Fashion," so long must she continue to be the cleverest adapter and remodeller of old designs. The vivacity of her artists checks any approach to *fac-simile* copying; and so skilfully are her revivals made that, while they seldom fail to recall a pleasing original type, they yet possess all the freshness of novel, and generally appropriate, design. Thus, in the ebony cabinet exhibited by Ringuet le Prince, the mind is carried back to some of the charming pieces of furniture still to be met with here and there in the old palaces of Italy—and yet the whole is composed and modelled with so much taste and freshness, that no doubt is entertained as to the cleverness of the artist, or his merits as an original designer. Again, in Marcelin's imitation of Indian inlaying in minute mosaic work, there is just sufficient departure from the original (principally in point of colour) to determine the work to be very clever French, instead of Oriental. To cite examples of a similar nature would be an almost endless labour: it may suffice generally to notice, as illustrative of the principle, the revivals of enamelling on copper in the Sèvres collection—the reproduction of the processes of Florentine and Milanese mosaic work by Theret—the examples of quasi-Indian embroidery of Billecoq; and the revivification of the spirit of Ghiberti and his Florentine successors in the "bronzes artistiques" of Barbedienne, and many others. It is a fact almost peculiar to France, of all the nations of the earth, that there appears to be scarcely a style or a process ever naturalised upon her soil which the Frenchman of to-day cannot produce in as great or greater perfection than that to which his ancestors were wont to carry it.

In the stained glass of Gerente, Marechal, Laurent G'sell, Hermanowska, and Lusson, the old glories of Suger and the Sainte Chapelle are still transmitted to us. In the productions of Ponssilgue Russand, Villemsens, and Rudolphi, the Limoges enamels, with which France supplied the world in the 13th and 14th centuries, are still elaborated with a spirit equal to their prototypes. In the royal manufactory at Sèvres every variety of preparing and painting enamel on copper, which was in use in the 16th and 17th centuries, by Leonard Limousin, Jean Courtois, Penicault, Luzanne Court, Nouailhier, &c., down to Toutin, and Petitot of Bordier, is still performed with a zeal and spirit worthy of the industry and talent of the great Limousin. The charming vases, dishes, and figures in "faïence," with which the indomitable Bernard de Palissy was wont to gladden the eyes of his royal master, the great Francis, are reproduced in the highest perfection by Avisseau. Many a frequenter of the old curiosity-shops on the Quay Voltaire has been taken in by the modern ivory carvings of Normandy, which simulate the mediæval "retables," triptics, and *cors de chasse*, with a spirit and exactitude calculated to deceive all but the most knowing in such matters.

Diverging from a consideration of those arts in which the perfect imitation of ancient forms or processes constitutes a chief merit, we may revert to others, in which modern improvements or changes involving the substitution of one material for another, have effected so great a revolution as to have created altogether new branches of industry. In such we shall find, as a general rule, that the French artist, deprived of direct precedent, has fallen back upon nature—whence he has drawn motives which his taste generally enables him to treat with just the amount of direct imitation, or of conventional arrangement, suited to the material in which he may be called upon to work. Thus, in the fine piece of chintz printing on a marone ground, exhibited, we believe, by the celebrated house of Kœchlin, the designer has introduced a magnificent group of flowers, in which roundness and the most brilliant colouring have been attained, without in any way carrying the imitation of nature sufficiently close to make apparent the inapplicability of the material as a medium for the expression of complete representation.

Thus, again, in silks, and ribbons, and in paper-hangings—while nature generally furnishes the base—flowers and other objects are indicated so gracefully, and are relieved from one another with such delicacy in each case, as to convey no sensation of imperfection. It is in the almost universal exercise of a judicious taste—retaining for each object its peculiar and appropriate style of treatment—that the great strength of the French artist-manufacturers (for so they must be called) consists.

Taking, for example, so common an object as the rose, how gracefully we shall find its treatment varied! On a Sevres vase it is painted "up to" nature—or to Constantine (for they are nearly the same thing). On a paper-hanging of Mader's, or Delacourt's, a few bold touches of "chique" serve, at a little distance, to convey almost as perfect an idea of the flower as was given by the elaboration of the China painting. The flower transferred to Lyons silk is the same in form, but changed in chiar' oscuro—the dark is gone, and all is light and brilliant. On a ribbon of St. Etienne the form is simplified, delicate white lines mark the separation of the rose leaves from each other, and the *ultimatum* of conventionality is attained: carried but one step further, the thing would become a meaningless red blotch.



BEDSTEAD—WILKINSONS.

Our readers may possibly think that we are regarding French industrial art a little too much *en couleur de rose;* but we would remind them that it is not only more difficult to find out beauties than defects, but much more improving. Let it not be imagined, however, that we are not alive to the temptations to which French artists are exposed by that very fertility of fancy, and that ready access to invaluable material in the way of precedent, on the possession and right use of which so much of their success depends. While, side by side upon the artist's book-shelf, stand severe works on antique art—Percier and La Fontaine's singular decorations of the old days of the "Empire," Le Pautre's anomalies, a set of Jullien's clever extravaganeies, Feuchère's fancies, Girault de Prangey's Oriental and Moorish works, and perhaps half a dozen volumes of Didron or Viollet Leduc's cruelly mediæval style — how, unless some guardian angel in the shape of good sense protect him, can any man avoid the whole herd of dilemmas by the horns of which he must find himself surrounded? If Le Pautre is right it must be evident to him that the antique is wrong. If Viollet Leduc and Didron are writers of truth and authority, what is to become of Jullien, or even Feuchère? If Percier and La Fontaine's style is perfection, what can be said for Girault de Prangey's Moorish enthusiasm. The very supply to artists of such groups and amounts of material—the very means which are taken by the State, through museums and gratuitous exhibitions of the most varied objects, to inform the artist's mind—determine the conditions of his practice, and leave him no alternative but either to degenerate into a servile copyist and devotee of one style, or to think for himself and become an Eclectic—selecting, and acquiring a mastery over, those elements of any style which he may on his own experience perceive to be productive of beauty, or which he may believe to accord with the common-sense conditions and limitations of the objects he is called upon to design. In France, the system of education of art-workmen (a class much wanted in England) is essentially good. In the first place, the artizan is made a good practical hand—is taught something of geometry—and, generally, in the schools of design, becomes an efficient draughtsman or modeller. Being thus qualified, labour and practice from day to day improve him; and whether his occupation be to set a group of diamonds, to carve a sideboard, or to chase a bronze, his hand acts in unison with his head, and each day renders him more completely master of the specialty of his manufacture and qualifies him to judge how far, and in what manner, the generalities of art can be made applicable to the improvement of the branch of manufacture upon which he may be engaged. In this way the education of the workman acts at once as a check upon, and a stimulus to, the artist. It was rather the general extension of the art of design than its perfection which was most striking in the French department. While the State maintains its protected manufactories, regal splendour may be ministered to by Sèvres china and Gobelin tapestry.

RAILWAY DEPARTMENT.

LOCOMOTIVE ENGINES.

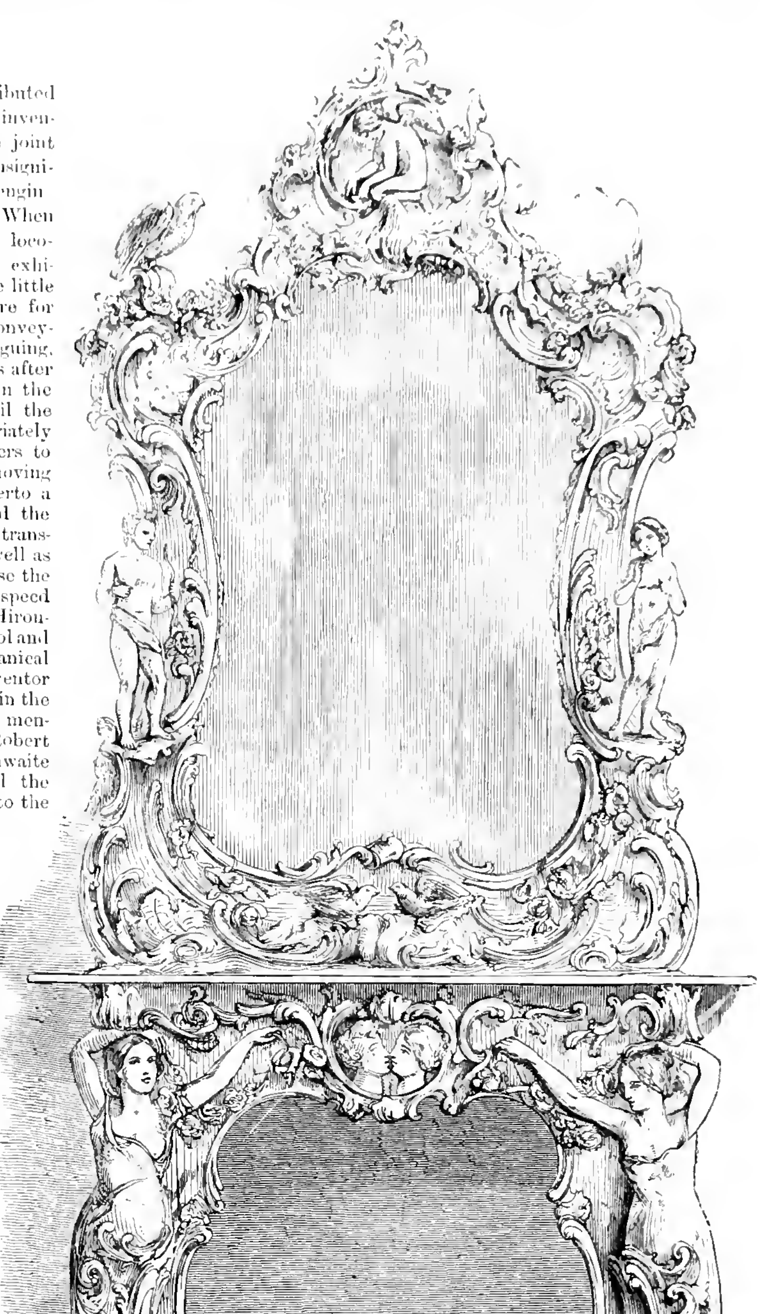
NGLAND, France, and Belgium, are the only countries which contributed specimens of the locomotive engine of 1851. Unlike some other inven- ns of great utility, the locomotive in its present state is the joint oduction of many minds. In its infancy it was a comparatively insigni- ant machine; in its present condition, however, a single locomotive engin the first class represents in power many hundreds of horses. When urdoch, the great friend of Watt, produced his three-wheeled loco- otive engine to run on common roads, a model of which was exhi- ed by the celebrated firm of Messrs. James Watt and Co., he little ought of the gigantic strides in locomotion which were in store for ose who should come after him—when travelling by public convey- ces, instead of being comparatively slow, irksome, and very fatiguing, ould become easy, swift, and positively luxurious. For many years after e appearance of Murdoch's mechanical novelty, the improvements in the comotive engines were few and far between; and it was not until the rectors of the Liverpool and Manchester Railway—most appropriately lled the grand experimental line—directed the attention of engineers to e important subject of the safest and most economical method of moving ads on the railway, that anything like velocity was obtained. Hitherto a eed of a few miles per hour, on the Killingworth Colliery line, and the ockton and Darlington Railway, had been found sufficient for the trans- rt of coals; but when it was determined to convey passengers as well as erchandise by railway, it became quite essential, in order to eclipse the st coaches of those days, to ensure a velocity above the high rate of speed hich distinguished the Devonport "Quicksilver," the Cheltenham "Hiron- dle," and the Shrewsbury "Wonder." The directors of the Liverpool and anchester Railway, however, in giving their invitation to mechanical gineers to compete for a premium to be awarded to the builder or inventor the best locomotive engine suitable for their railway, were satisfied, in the st instance, with a speed equal to that of the fast coaches already men- ned, viz., ten miles an hour. The competitors for the prize were Robert ephenson, of Newcastle; Timothy Hackworth, of Shildon; and Braithwaite d Ericson, of London. The "Rocket," the "Sanspareil," and the Novelty" were the three engines sent by the respective competitors to the eat trial railway.

The "Rocket" had outside sloping cylinders of 8 inches diameter, th a stroke of 16½ inches: the driving wheels, placed towards the ont, were of 4 feet 8½ inches diameter; while the trailing wheels ere three feet in diameter: the boiler, at the suggestion of Mr. ooth, the treasurer of the Liverpool and Manchester Railway Com- ny, was multitubular, and is said to have been the first of the nd used in this country; the tubes were each of 3 inches dia- eter, and altogether 25 in number: the heating surface of tubes s equal to 117·75 superficial feet, and the fire-box surface to 20 et; the area of the fire-grate was equal to 6 feet; the chimney s placed in front of the engine, as in all modern locomotives; e exhaust steam was discharged into the chimney, the beneficial ects of which were soon discovered.

The "Sanspareil" was mounted on four coupled wheels, of 4 feet inches diameter, the driving-wheels in connexion with the piston- d being towards the back part of the engine; the cylinders were rtical, and of 7 inches diameter, with a stroke of 18 inches; the ate and chimney were situate in front of the boiler, connected by flue tube having one bend, the diameter of the tube being 2 feet the grate and 1 foot 3 inches at the chimney. The surface at e grate was equal to 10 superficial feet; the steam was discharged o the chimney by means of a blast-pipe, whereby the draft was aterially increased. The tube surface was equal to 74·6 feet, and at of the fire-box 15·7 superficial feet. The weight of this engine s about 4¾ tons, while that of the "Rocket" was only 4¼ tons.

The "Novelty" presented, upon the whole, the least cumber- me appearance, and its construction differed essentially from that each of its competitors. The fire-box was circular, of 18 inches ameter, and surrounded by the water of the boiler: it was sup- ied with fuel by means of a hopper. A single tube, of 36 feet in ngth, with two bends, passed from end to end of the boiler three nes; bellows placed near the chimney served to keep the fire ve. The "Novelty" had only one cylinder, of 6 inches diameter, th a stroke of 12 inches; the wheels, four in number, were each 4 feet 6 inches diameter, the driving-wheels being connected with e piston by means of bell-cranks. The heating surface of tube s only 33 feet, and a fire-box 9½ feet, the surface of grate being ual to 1·8 foot. The weight of this engine was not much more an three tons, and during the experimental trip there was no nder attached to it. The average speed of the "Rocket," drawing gross load of 17 tons, was upwards of 13 miles an hour; and the Sanspareil," with a gross load of rather more than 19 tons, 14 les per hour; and of the Novelty, with a gross load of nearly 10¾ ns, 15 miles an hour. The "Novelty," however, broke down more an once during the experiments; and the "Rocket" alone accom- ished the distance of 70 miles, the whole length of the trial run.

Two other engines, with several improvements, were afterwards

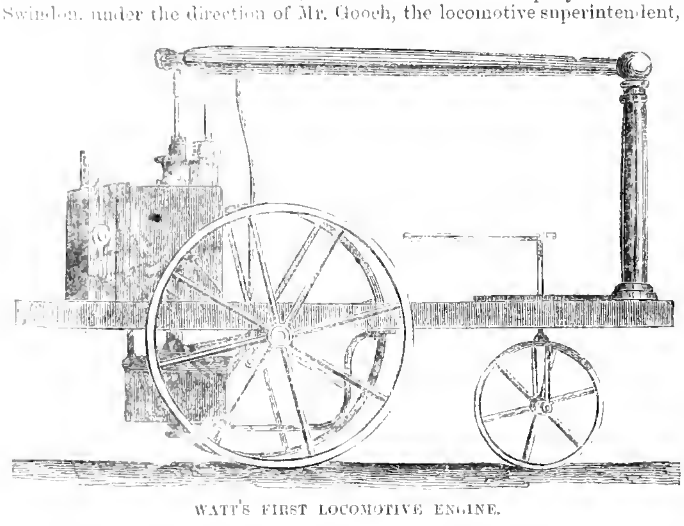


MARBLE CHIMNEY AND MIRROR FRAME, FROM MILAN.

In the vestibule of the Austrian Sculpture Room, were two or three showy marble chimney-pieces, which it was impossible to pass unnoticed, but which it is impossible to admire. In any case, over-ornamentation of chimney-pieces should be avoided, and in all cases the ornamentation should be of an architectural character in harmony with that of the rest of the apartment. In the example before us, we have a full-grown Cupid with his bow and arrow pointed at a young nymph on the opposite side, who seems to receive the attack very complacently; in other parts are other figures, doves, &c., in *consonnance* with the same idea. The ornamental parts of this affair are executed by Giuseppe Bottinelli; the figures by Dominico Gandolfi.

built by Mr. Stephenson, after the plan of the "Rocket," each having an extent of heating-surface more than double that of the "Rocket." Mr. Nicholas Wood, of Killingworth, was also engaged in altering the boiler of one of the old Killingworth engines: and, at the same time, Mr. Timothy Hackworth was making vast improvements in the boilers of the Stockton and Darlington Railway engines: and it is reported that Mr. Hackworth's engine, called the "Globe," was the first to run at so high a speed as 50 miles per hour. Mr. Bury, Messrs. Fenton, Murray, and Jackson, Messrs. Hawthorn, Messrs. Mather, Dixon, and Co., Messrs Taylour, Messrs. Sharp, Roberts, and Co., and Messrs. G. Forrester and Co., followed the earlier locomotive engine-builders; and supplied a vast number of engines, from time to time, not only to the British, but also to the foreign lines of railway. The British locomotive engine-builders of the present day, who sent samples of their productions to the Great Industrial Exhibition, are Messrs. Hawthorn, Mr. Crampton, Messrs. Stephenson and Co., Messrs. Kitson and Co., Mr. England, Messrs. Fairbairn and Sons, Messrs. Bury, Curtis, and Kennedy, Messrs. E. B. Wilson and Co., and the Great Western and North-Western Railway Companies respectively.

Taking the engines in the order adopted by the compiler of the Official Catalogue, we found the monster engine of the Great Western Railway (No. 596, Class 5) placed on a piece of permanent way, as a sample of the Great Western line, towards the west end of the Railway Department of the Great Exhibition. This engine was built at the company's works at Swindon, under the direction of Mr. Gooch, the locomotive superintendent,



WATT'S FIRST LOCOMOTIVE ENGINE.

and is altogether a fine specimen of the work turned out at that extensive and interesting establishment. It is mounted on 8 wheels, 4 of which are in front of the engine; then the driving-wheels, of 8 feet diameter; and, lastly, the trailing wheels, corresponding with those in front: the diameter of cylinder is 18 inches, and the length of stroke 2 feet. The number of tubes running through the boiler is 305, giving a radiating surface equal to 175[illegible] feet, while the heating surface of the fire-box is equal to 156 feet, the maximum pressure of steam being 120lb.; the actual power of this machine, as ascertained by a dynamometer, is equal to that of 743 hŏrses. At an average speed of 60 miles an hour—the flight of the pigeon—this steam monster is able to draw the enormous load of 120 tons. The weight of the engine without fuel and water is 31 tons, and with complement of fuel and water 35 tons. In addition to which, the tender, which is mounted on 6 wheels, weighs 9 tons empty, but charged with water and coke, 17 tons 13 cwt., making the total weight of engine and tender at starting 52 tons 13 cwt. The consumption of coke, with an average load of 90 tons and average speed of 29 miles per hour, has been found with the ordinary mail trains to amount on an average to 20·8lb. Most persons who have been accustomed to travel in the first class carriages of the Great Western Railway, especially by the express train, will allow that nothing can be more luxurious in the way of locomotion than to leave London with a morning paper damp from the press, and be transported rapidly into the beautiful county of Devon, almost before you have finished the news of the previous twenty-four hours.

Next in order we find Mr. Crampton's express locomotive engine, the "Folkestone," built for the South-Eastern Railway Company. The peculiarity of this engine is the position of the driving-wheels, of 6 feet diameter, behind the fire-box, whereby an intermediate shaft is rendered necessary. We have heard that great things are accomplished by this form of engine; but having no particulars nor accurate information on the subject, we are unable to enlighten our readers as to the true state of the case.

"Speed, safety, and economy," in gilt letters on a blue flag, suspended over the "Little England," attracted the attention of the visitor to Mr. England's comparatively diminutive locomotive engine, numbered 509: the driving-wheels in middle, are 4 feet 8 inches in diameter, and the leading and trailing wheels 3 feet; the boiler is multitubular, and only of 30 inches diameter. The tank and coke receptacle are on the same frame as the engine—a plan which was successfully used 10 or 12 years ago, and which is now likely to come into vogue, especially for branch lines of railway.

"Ariel's Girdle," No. 510, constructed by Messrs. Kitson and Compan of Leeds, according to the patent of Mr. W. B. Adams, is another samp of a light tank engine. It has, however, only four wheels—the hind pa of the engine being connected with a composite carriage, underneath whi one of the tanks is suspended. The cylinders are of 9 inches diamete with a stroke of 15 inches; driving-wheels of 5 feet and leading wheels 2 fe 6 inches diameter, respectively; multitubular boiler, containing 83 tube each of $1\frac{3}{4}$ inch diameter, giving a heating surface of 456 feet superfici in addition to 39 feet for the fire-box—giving a total radiating surface 495 feet. The coke receptacle is over the fire-box, and is capable of holdi 6 cwt. The tank under the engine holds 304 gallons of water, and th under the carriage, 533 gallons; together 837 gallons. The composi carriage in connection with the engine is also mounted on 4 wood whee with wrought-iron tires. This description of locomotive and carriage especially calculated for branch railway passenger traffic—has been successful tried on the Eastern Counties Railway.

The London and North-Western Railway Company exhibited their expre locomotive engine, called the "Liverpool," built according to Crampto patent principle. It is mounted on 8 wheels—the driving-wheels, of 8 fe diameter, being, as in the case of the "Folkestone," behind the fire-box; t leading wheels being each of 4 feet diameter; the cylinders, placed outsi are of 18 inches diameter, with a stroke of 24 inches; the total area radiating surface is equal to 2290 feet superficial, of which 154 feet is deriv from the fire-box; the total weight of engine, with fuel and water, is tons, being 2 tons more than that of the Great Western engine, alrea described. According to the Official Catalogue this engine was exhibit for its great amount of heating surface and its general construction.

The same Company exhibited the "Cornwall," built by Trevethick, a no doubt, named by himself after his native county. The novelty of t engine chiefly consists in the boiler being suspended between the wheels. was built at the company's locomotive establishment, Crewe, in 1847, a was shown at the World's Fair for "improved construction." The cylinde are outside, and of $17\frac{1}{4}$ inches diameter, and stroke of 24 inches. T driving-wheels are 8 feet 6 inches in diameter; the weight of engine 27 to

The celebrated firm of Fairbairn and Sons, of Manchester, also exhibit a tank-engine, whose boiler is 8 feet in length, and 3 feet in diameter, havi 88 brass tubes, each of 2 inches diameter. The effective heating surface equal to 480 square feet; the fire-box of copper 2 feet 5 inches long, 3 f broad, and 3 feet 5 inches deep. The cylinders are of 10 inches diamet with a stroke of 15 inches. The driving-wheels, in the middle, are o feet diameter, and the leading and trailing-wheels of 3 feet 6 inches diame respectively. The tank is placed underneath the foot-plate, and conta 400 gallons of water. The ascertained consumption of coke by this engi is 10lb. per mile; and in working condition the weight is 13 tons: use load, 6 composite carriages, with 250 passengers. Similar engines are work on the railway from Lancaster to Skipton, and on the Belfast a County Down, and Newry and Warrenpoint lines respectively.

A double boiler-tank engine was exhibited by Messrs. E. B. Wilson a Company. As its name to a certain extent implies, the principal nove consists of introducing two multitubular boilers side by side instead of o as in all other locomotives of the present day. It has 6 wheels, 4 of whi are coupled, including the driving-wheels, of 5 feet diameter; while t leading-wheels are 3 feet 6 inches. The outside cylinders, placed horiz tally, are $12\frac{1}{2}$ inches diameter, with a stroke of 18 inches. The who length of engine is 24 feet 3 inches; breadth, 8 feet 3 inches; and heig from surface to top of chimney, 13 feet 6 inches; the whole weight engine, exclusive of fuel and water, is 16 tons; and the additional weig with complement of coke and water, 3 tons 17 cwt.; making together tons 17 cwt. The tubes, of $1\frac{3}{4}$ inch diameter, are altogether 136 number, giving a radiating surface of 694 feet superficial, in addition which the heating surface of fire-box is 61 feet; together, 755 superfic feet. The tanks will hold 520 gallons of water, which is found sufficie for a journey of 25 miles. The coke space is equal to 42 cubic feet, or cwt., equal to 26 bushels of coke. In addition to the above particulars, are enabled, owing to the intelligence of the attendant, to furnish t following:—Buffers, 5 feet 9 inches apart, and 3 feet 3 inches above the surface of rails; the centre line of boiler is 4 feet $9\frac{1}{2}$ inches above the sa level; length of the boilers, 10 feet; and diameter of each 21 inches. T fire-boxes, 2 feet 2 inches by 1 foot 9 inches, and 4 feet 9 inches high; fir box shell, 1 feet 4 inches by 2 feet 9 inches; front and back water space 3 inches; middle ditto, $3\frac{1}{2}$ inches; sides, $2\frac{1}{2}$ inches; collective areas of cro section of tubes, 289 superficial feet; area of fire-grate, 7 feet 5 inche length of connecting-rod, 4 feet $9\frac{1}{2}$ inches; diameter of pump valve, inch; length of slide block, 10 inches; diameter of crank-axle in centre, inches; size of under-bearing, 7 inches; and of outside-bearing, $5\frac{1}{2}$ inche diameter of trailing-axle, $5\frac{1}{2}$ inches; size of bearings, 7 inches by $5\frac{1}{2}$ inche diameter of leading-axle in centre, 4 inches; bearings, 7 inches by $3\frac{3}{4}$ inche breadth of tires, $5\frac{1}{4}$ inches; thickness, $2\frac{3}{8}$ inches; spring plates, $3\frac{1}{2}$ inch by 5-16ths. inch.

Messrs. Kitson, Thompson, and Hewetson, of Leeds, the builders of t little engine on Adams's principle, called "Ariel's Girdle," also exhibited o of their own tank engines on 6 wheels, the drivers being in the middle, an of 6 feet diameter, while the leading and trailing-wheels are 3 feet 8 inche diameter respectively; the cylinders, placed outside, are of 11 inche diameter, with a 22-inch length of stroke; there are 105 tubes, each of 1 inch diameter, giving 536 superficial feet of heating surface, with a addition of 62 square feet for the fire-box, making together 598 feet. T

s will hold together 500 gallons of water; the complement of coke 10 cwt. The whole is well finished, and the name we find attached is "Aerolite," numbered in Catalogue 531.

st, though not the least important of the locomotive engines exhibited rious celebrated makers at the World's Industrial Show was a hand- passenger-engine from the works of Messrs. R. and W. Hawthorn, of astle, whose house has now been famous for so many years. It is ted on 6 wheels; the drivers being 6 feet 6 inches, and the fore and wheels of 3 feet 9 inches in diameter respectively. The cylinders are inches diameter, and the stroke of piston 22 inches. The number of , of brass, is 158, each of 2 inches external diameter, giving a radiating e of 865·4 superficial feet, in addition to 110 feet of fire-box, making l of 975·1 superficial feet. There is a bridge across the fire box, having ditional water space. All the framings, both inside and out, extend ll length of the engine, and are firmly connected together by strong double-knee brackets. The whole of the machinery was fitted and entirely independent of the boiler, and, when completed, the wheels xles being put into their proper positions, the boiler was fixed in its , and firmly secured by bolts to the brackets already mentioned and to utside frames. There are four novelties in this engine; viz., Messrs. horn's patent double-compensating beams, their patent slide valves, patent link motion, and their patent steam-pipe. Instead of the 6 gs ordinarily used in locomotive engines, the builders of the wthorn" have introduced on each side of the engine 2 beams and 2 gs, by which a direct action is communicated at once to all the axle ngs, so that an uniform weight is constantly maintained on each of the ls and axles, thereby securing a constant amount of weight upon the ng-wheels for adhesion, a matter of considerable importance. Secondly, atent slide-valves are placed vertically between the cylinders in one -chest in the usual manner. One slide-valve has a plate, cast or l upon the back which is accurately planed so as to be perfectly lel with the face of the valve. The other slide-valve has a box cast the back, into which is fitted a projection or piston, the face of which planed so as to be parallel with the valve; it is packed in the most e manner and made steam-tight, and then put into the steam-chest, as linary valves. A passage is formed between the exhaust-ports through lide-valves, thus giving a free discharge to the steam. These valves are ed from one-half the pressure of steam, and, consequently, one-half iction. Thirdly, the patent link-motion is also introduced into the inery of this locomotive. The expansion link, instead of being con- d to the ends of the eccentric-rods, and having to be continually raised d down with them, is directly connected by an eye-joint to the slide- nd there suspended; hence its weight is removed from the reversing Having a fixed centre, the link requires less power to move and ate the slide-valves: the link is also much more durable, as the sliding- is more than three times the length of the ordinary block. Lastly, patent steam-pipe is substituted for the domes and cumbrous pro- us on the top of the boiler: this pipe is fixed into the tube-plate of the e-box by a ferule, as in the case of an ordinary tube, and extends y the whole length of the boiler, being placed near to the top; it is rated along its entire extent with small slits, so proportioned as to t the steam into the pipe directly above the place of generation. This anifest improvement on the ordinary method, where the steam has to from all parts of the boiler to one or two orifices, as it is now con- l to the cylinder in a purer state: moreover, *priming* is, to a consider- xtent, avoided.

ving completed our survey of the British locomotive department, we how briefly describe the locomotive engines sent by our Belgian and h competitors respectively. From Belgium we find only two engines, rom France only one. The first Belgian contribution came from the té de Couillet Belgique, and is a 6-wheel engine, constructed after the adopted for some time by Messrs. R. Stephenson and Co. of Newcastle. wheels of 5 feet diameter each, are all coupled: the boiler is multi- ar, and contains 185 tubes of $1\frac{3}{4}$ inch diameter. The workmanship nish are altogether inferior to the manner in which all the British otives are turned out. A 6-wheel tender is attached.

e second Belgian locomotive engine came from the celebrated house ckerell and Co., of Seraing, near Liège, one of the most extensive lishments of the kind in Europe, where the coal and iron are raised on pot, and the latter converted, by powerful machinery, into the various of locomotive and fixed engines, which are turned out in considerable bers. Having had an opportunity of going over the Seraing works, we abled to speak of the interesting establishment in which the "Vallée Vesdre" was constructed. This engine is mounted on eight wheels, of which, including the drivers, of 4 feet diameter, are placed behind, four bearing wheels, of 2 feet 8 inches in diameter, in front; the lers are placed outside, and in a sloping position. The novelty in this otive appears to be a "donkey," or auxiliary pump, with, however, d deal of work about it.

e solitary locomotive engine from France named the "Lahore," came the firm of Messrs. J. F. Cail and Co. being somewhat similar to that Belgian Company, Couillet, having 6 coupled wheels of 5 feet diameter.

BEDSTEAD. BY WILKINSONS.—(SEE P. 348.)

is is one of the four specimens of the genuine four-post bedsteads ited. It is of walnut wood; rather heavy, perhaps, in its proportions. ery magnificently carved. The draperies were of rich crimson damask.

GARDEN FURNITURE.

THE two great troubles of amateur gardeners, especially ladies, are blistered hands and aching backs. The first of these may be consider- ably lessened by wearing gloves, where the nature of the operation will admit of it; but, for the pains induced by incessant stooping we see no remedy, and can only look for relief by the invention of tools which, by their peculiar construction, shall render frequent stooping unnecessary, beyond a certain "graceful bend" at least with regard to the operations of digging, hoeing, raking, weeding, drilling, dibbling, watering, sticking peas, sowing seeds, transplanting shrubs, cleaning garden rollers, &c. How far the various inventions intended to lighten and facilitate these garden operations will accomplish so desirable a result, it would be temerity to affirm, without first obtaining some special experience; suffice it to say, that, in several cases the promise bore a very feasible look, and, in a few instances, we feel no doubt of the advantages to be derived from the use of such tools or implements.

One of the first things that attracted our attention in the department of Agricultural and Garden Implements in the Great Exposition was Boyd's patent double action or self adjusting scythe. It was not merely the scythe that caught our admiring eye, but the ingenious device of a little figure of Saturn, or Father Time, with *two* scythes, one of these being the old original scythe, which was carried over his shoulder, the edge of the blade being so close to his neck as to suggest that if he happened to stumble it would cut his head off, while in his right hand he holds Boyd's scythe, carefully shut up like a long clasp-knife, and so safe as to be incapable of doing injury either to the bearer or to anybody passing near him. This is evidently a great improvement. It is so much better than leaving such a dangerous instrument at all times open to do mischief, or else bundled round clumsily with whisps of hay or straw. Mr. E. Jame also exhibited a patent self-adjusting scythe, which can be put together without any assistance from a blacksmith, and shuts up like a knife.

Mr. B. Ebbs offers a very remarkable garden implement for the use of ladies. It comprises a hoe, spud, and rake, all in one tool, and is very light to handle. It is proposed, by means of this, to enable a lady to root up weeds growing round strawberries, or other plants, hoe the earth round them, and rake it clear and smooth, and all this without any necessity for stooping down or changing the tools.

Henton's garden-roller is a very ingenious and excellent invention for lightening the weight of the draught. Every amateur gardener has felt how hard a labour it is to drag a garden-roller for any length of time, especially after rain or over heavy ground. On the usual plan, you have the full weight of the roller to drag; but in the present invention of Mr. Henton it is cleverly contrived that the weight of the roller shall con- tribute to its own motion, and, in fact, assist in rolling itself over.

We must call attention to Deane, Dray, and Co's stock of ladies' garden tools, such as hoes, rakes, and spades. They also presented to our notice the "fruit-gatherer" (a staff or pole, with an apparatus at the top for cutting a stalk, and a little net bag, like an angler's landing-net, underneath, to catch the fruit that falls); and the "averuncator," which is an instrument for pruning the higher portions of fruit trees, plants, and shrubs, without the need of mounting steps or ladders. It is a pole, with a cutting-instru- ment at the top, like a bending forefinger, or a pair of semi-circular scissors, and seems quite likely to perform its office, to admiration, provided its machinery does not get entangled in the boughs. But why call it by so pedantic a name as the "averuncator?" The "pruning pole" would be worth a thousand of it.

Clayton's spades for gravel, or clayey soils, and adapted to different works of a laborious kind, or in a confined space, seem to be valuable additions to our stock of agricultural implements.

Dr. Spurgin's hoes are of very novel formation, presenting a shape not unlike that of a sharp ace of clubs, the tops of Gothic windows, or like some of the apertures and ornaments in Gothic architecture. One of them rather resembles a bird standing upright, with his head cut off. They are light, curious, and we are disposed to believe they may be turned to excellent use in garden work.

The cast-iron garden-seats, tables, and chairs, of W. Dray and Co., have a very handsome bronze like appearance; they are strong, yet of elegant design, and are not expensive.

Mr. Francis Parkes exhibited a variety of spades and forks, the chief peculiarity of which seemed to be their thinness, sharpness, and lightness. One of the spades for instance, is so thin, that we should fancy the act of digging would very quickly be brought to a stand still by the pain it would cause the foot, if it did not shortly cut through the boot; but perhaps the tool is not intended for digging so much as to be used as a shovel.

A refinement, amounting, we think, to dandyism, has of late made its appearance among our garden furniture, in the shape of delicate white porcelain labels for flowers and plants. There were likewise metallic labels for gardens and conservatories, which are very good; and we especially commend Mr. Restell's invention of flexible pegs, props, and wall-holders. The pegs we have found very useful indeed, during the present season, in pegging down verbenas, petunias, &c.

Toby and Son exhibited the model of a green house, with potting-shed and fruit room attached, and showing the boiler and hot-water pipes, with improvements in ventilation. This is a very good model indeed, and con- veys a complete idea of what is intended. Their horticultural implements were likewise deserving of attention.

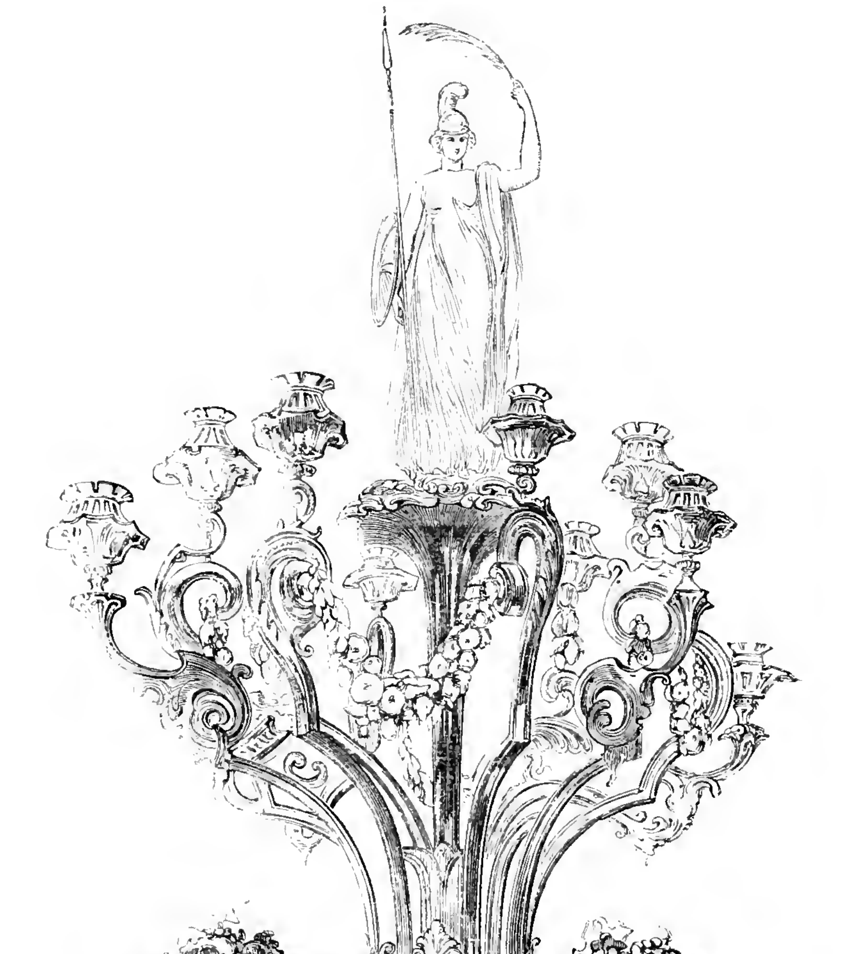
The ornamental ironworks of Edward Upfill are articles of great importance in garden furniture. We much admire the beauty and durability of their garden-seats, arches, entrances, alcoves, and general trellis-work for the training of roses, clematis, and other creeping plants.

Thomas Smith's strawberry pan is an excellent invention. It is in form something like an inverted hat with the crown knocked out, and the broad brim turned down, or rounded over. Two or three strawberry plants being enclosed in the hat, their leaves and fruit will rise and roll over the broad brim, receiving heat from the surface they lie upon, which also protects them from the dust and dirt, and from being spoiled by lying in the damp after rain.

The sticking of peas is often found to be a fatiguing operation to amateurs; and, besides blistering the hands, the whole row is not unlikely to give way with the first good windy gust that sweeps across the garden, if not strongly fixed in the ground. To obviate this, Mr. W. Stent has invented a new pea supporter, which we commend to all amateur gardeners, more especially the ladies. Henceforth, so far as the growth of peas is concerned, they may consider themselves quite independent of the help of man.

For a "single seed planter" and a "single seed dibbler" we are indebted to Mr. T. Revis, of Stockwell.

Everybody who has ever engaged in the delights and toils of a garden of any dimensions must know what it costs to transplant large shrubs and good-sized trees. But here again the Great Exposition offers us a helping hand, under the auspices of Mr. W. Seaward, of Oulton, Wakefield, who has designed a tree remover, "for transplanting large shrubs and trees." He also offers a "conifera supporter," to prevent cypresses, *arbor vitæ*, &c., from being broken down by the weight of the snow, which, from the form and position of the foliage of these and other trees of the kind, often loads them to excess, and, breaking off a large bough, frequently destroys the symmetry of the tree for ever.



CENTRE-PIECE—LAMBERT AND RAWLINGS.

To all those who have lawns, we beg to suggest that the invention of Mr. J. Watt, of Scotland, deserves attention. It consists of a machine on an improved principle for "broad-cast sowing," and is intended grain and for all grass seeds. Nothing looks worse on a lawn th a number of ba patches. Here there the remedy.

Mr. P. Green, Leeds, exhibited aviary and garden se made of wire. T light and airy appe ance of these will pr bably render them vourites to those w once possess the Garden seats and pla stands were also ex bited by Mr. J. Holm of Newcastle-on-Tyn

Aphides, caterpilla and other insects, dreadful pests of flow and foliage, as eve one who has a gard or even a few plan but too well kno Behold, then, a reme in Mr. D. Brown's tent instruments for migating, intoxicati and rendering all-th insects either utte helpless and at y mercy (such as it n be), or reduced to many little dead specks upon the lea according to strength of the d Mr. Epps, of Maidsto likewise offers us "sulphurator," an strument for throw flower of sulphur i diffused state u grapes, hops, p roses, &c., for purpose of destroy mould or mildew, antagonists that sometimes as voraci and fatal as the w insects.

But who shall ev digging? Who t "gardens" shall e escape the labour the spade, with hot blistered hands, an breaking back? W shall ever be able shirk his spade? W everybody may do now, since Mr. J. sons, of Stamford-l has invented a "digg machine." It is cl that we shall soon h the means of escap from all manual labo of every sort, in gardens. We may in our seat of ornam tal wire, or Gothic ca ing, or of rustic l and branches, and Mr. Parsons' mach dig; Mr. G. Flemi machine destroy wee moss, lichens, &c., our gravel walks; W. Keene's machine p pare seeds for sowi Mr. W. Padwick's drills and dibbles make the earth ready to receive the Mr. J. Watt's machine sow them for us; and the garden engines of Crump, of Derby, or Dr. Kennedy, of Dublin, water them after they h been covered over by the various patent spades and rakes of numer other meritorious exhibitors.

The
CRYSTAL PALACE
AND ITS CONTENTS.

AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

PAOLO AND FRANCESCA.—A. MUNRO.

GIRL PRAYING.—J. A. M'DOWALL, R.A.

LASTER GROUP—PAOLO AND FRANCESCA. BY A. MUNRO.

. MUNRO, in this little group, seeks to realise the incident described Dante, or rather by his heroine, Francesca, for she is supposed to relate own sad story to him, in the following passage, as translated by Cary :—

———————— One day,
For our delight, we read of Lancelot,
How him love thralled. Alone we were, and no
Suspicion near us. Oftimes by that reading
Our eyes were drawn together, and the hue
Fled from our alter'd cheek. But at one point
Alone we fell. When of that smile we read,
The wished smile, so rapturously kiss'd
By one so deep in love, then he, who ne'er
From me shall separate, at once my lips
All trembling kiss'd. The book and writer both
Were love's purveyors. In its leaves that day
We read no more.

'e need hardly say a word to point out the difficulties which too obviously ound the treatment of such a subject in sculpture; at least, if it be mpted to represent *all* that the poet conceived of it. One point referred the passage, "the hue fled from our alter'd cheek," it is impossible to render through this medium, because it is a material *always* colourable and even to express the idea of strong emotion as conveyed through the eyes, is a thing which has never been attempted in the plastic art. Nevertheless, Mr. Munro, who is a young artist of very considerable promise, has produced a very pretty and graceful composition, though at the same time one which, costume, accessories, and all considered, would have been better adapted for a painting than a work in plaster. As regards expression, he has certainly accomplished a great deal—much more than we would have been prepared to expect: the face of Paolo is earnest and impassioned in the extreme; it tells of a devouring passion long pent up, now first revealing itself; that of Francesca confesses a reciprocity of feeling, but with a modest hesitating reserve, which is admirably true to the more delicate poetry of the situation. Since this group was exhibited, we are glad to understand that Mr. Gladstone has commissioned the artist to execute it in marble.

GIRL PRAYING. BY M'DOWALL.

THIS very graceful production reflects the highest credit upon Mr. M'Dowall's talent. The expression is extremely charming, and the attitude simple and effective. It stood in the southern transept, where it was greatly admired.

No. 23, MARCH 6, 1852. PRICE ONE PENNY.

TEXTILE MANUFACTURES.

BEFORE proceeding to give a report upon our silk manufactures, we extract the following able historical account of the raw material from the Lecture of Professor Owen, on the "Raw Materials from the Animal Kingdom."

SILK.

"From a product of the most gigantic of animals I next proceed to notice one derived from a seemingly insignificant insect; yet it is the most costly of all raw materials for textile purposes,—I allude to silk. The most valuable kind of silk, and that which is the subject of the most extensive and pains-taking culture, is a secretion of the larva of a species of moth, indigenous to China, called, *par excellence*, the "silk-moth," and by entomologists *Bombyx mori*, from its native and favourite food, the leaves of the mulberry-tree.

"Raw silk was imported into Europe long before the insect which produces it: but the antiquity of this raw material for the richest of our textile fabrics, by no means goes so far back as that of wool.

"There is no certain reference to silk in any part of the Old Testament: the Hebrew word so rendered by King James's translators (Ezekiel, xvi. 10, 13) may signify "fine flax;" and the learned Braunius concludes that silk was unknown to the Hebrews.

"The first definite mention of silk, with a notice of the creature producing it, is in the fifth book of the 'Historia Animalium' of Aristotle. He indicates the island of Cos as the place where silk was woven into cloth: and he mentions (cap. xix. p. 850, Duval) four states of the insect which produces silk, under the terms *σκώληξ*, *κάμπη*, *βομβύλιος*, and *νεκύδαλος*; and these terms were understood by ancient writers after Aristotle, and no doubt correctly, to signify the states which modern entomologists would call the 'young larva,' the mature or 'spinning larva,' the 'pupa' with its cocoon, and the 'imago,' or perfect insect.

"In the New Testament, the use of silk is mentioned once unmistakeably (Revelation, xviii. 12).

"The beautiful illustration of the Christian doctrine of the resurrection, which Basil, in the year of our Lord 370, drew from insect-metamorphoses, shows plainly that he had obtained his facts by a perusal of the famous zoological treatise of Aristotle:—'What have you to say, who disbelieve the assertion of the Apostle Paul concerning the change at the resurrection, when you see many of the inhabitants of the air changing their forms? Consider, for example, the account of the horned worm of India, which, having first changed into a caterpillar (*eruca* or *veruca*), then in process of time becomes a cocoon (*bombylius* or *bombulio*), and does not continue even in this form, but assumes light and expanding wings. Ye women, who sit winding upon bobbins the produce of these animals—namely, the threads which these Seres send to you for the manufacture of fine garments—bear in mind the change of form in this creature, derive from it a clear conception of the resurrection, and discredit not that transformation which Paul announces to us all.'

"Galen judiciously recommends silk threads for tying blood-vessels in surgical operations. The Roman poets and satirists made frequent mention of the luxurious silken clothes and attire, which were introduced at enormous expense during the period of the Empire. The silk so obtained was exported from Persia and India; but whether the *Bombyx mori* had been introduced into those countries at that period, or whether the raw material was obtained from China, is uncertain.

"That silk was most abundant in China we learn from the oldest records of the singular people inhabiting that country, where from an early period, not only the mandarins, but all persons in easy circumstances, as well male as female, have worn silk, satin, or damask clothes. Even the uniforms of the soldiers were made then, as now, of this elsewhere considered so valuable material.

"Of the wild original of the *Bombyx mori* there is the same incertitude as with regard to most domesticated animals. The description which is given by M. Bertin in his work entitled 'China, its Costumes, Arts, and Manufactures' seems to refer, as M. Latreille remarks, to the large *Phalæna atlas*. The wild silkworm is there said to curve a leaf into a kind of cup, and then to form a cocoon as large and nearly as hard as a hen's egg. These wild cocoons are so strong and so compact, that the insects have great difficulty in extricating themselves, and therefore remain enclosed from the end of the summer to the spring of the following year. These moths fly well. The domestic silk-moth, on the contrary, soon extricates itself, and has very feeble powers of flight. The wild silk-moth feeds indifferently on the ash, oak, and nagara; the *Bombyx mori*, as its name implies, feeds by choice, if not exclusively, on the leaves of the mulberry-tree.

"I have now to speak of the introduction of the silk-worm into Europe. According to Procopius, the *Bombyx mori* was first introduced into Europe in the reign of the Emperor Justinian, by two Nestorian monks who had travelled in Serinda,—which, whether it be India or China is uncertain,—and who succeeded in bringing a quantity of eggs,—secured (according to Photius), in a hollow cane,—to Constantinople, where they were hatched, and the larva fed and reared on the leaves of the black mulberry. The breeding of silkworms in Europe was confined for six centuries to the Greeks of the Lower Empire. In the twelfth century, the rearing of silkworms and the manufacture of silk were introduced by Roger, king of Sicily, into Palermo, whence this important branch of industry was rapidly and successfully established in Italy, Spain, France, England, and subsequently in most of our colonies possessing a suitable climate.

"Silk is a secretion of a pair of long glandular tubes, called 'sericteria,' which terminate in a prominent pore or spinnaret on the under lip. Before their termination they receive the secretion of a smaller gland, which serves to glue together the two fine filaments from the two 'sericteria;' the apparently single thread being, in reality, double, and its quality being effected by the equality, or otherwise, of the secreting power of the 'sericteria.' The silkworm commences spinning when it is full grown, in some convenient spot affording points of attachment for the first formed thread, which is drawn from one part to the other until the body of the larva becomes loosely enclosed by the thread. The work is then continued from one thread to another, the silkworm moving its head and spinning in a zig-zag way, in all directions within reach, and shifting the body only to cover the part which was beneath it. The silken case so formed is called the 'cocoon.' During the period of spinning the cocoon, which usually takes five days for its completion, the silkworm decreases in size and length considerably; then casts its skin, becomes torpid, and assumes the form of the chrysalis.

"The main object of the silkworm-breeder is to obtain cocoons of large size, composed of a long, strong, very fine, even, and lustrous thread. These properties of the silk were found realised in the highest degree in the specimens transmitted from France, in which country the development of the silkworm has for a long period exercised the care and pains of many able silkworm-breeders, and of late years has been the object of systematic advancement by the Central Society of Sericiculture of France.

"Much skill is exercised—I wish I could add without cruelty—in the art of killing the pupa and extracting it from the cocoon, and in preparing the latter for unwinding the delicate thread; heat being the agent of destruction in most of the processes, as it seems to have been in the remotest historic times in China. The method there employed, according to the old French missionaries in China, is as follows:—"The extremities of the cocoon are first cut off with a pair of scissors; they are then put in a canvas bag and immersed for an hour or more in a kettle of boiling lye, which dissolves the gum. When this is effected, they are taken from the kettle, are pressed to expel the lye, and are left till the next morning to dry. Whilst they are still moist the chrysalis is extracted from each cocoon, which is then turned inside out to make a sort of cowl. They are then easily wound into thread.'

"An accomplished author, who has celebrated the Great Exhibition in a work full of apt and striking allusions, beautifully apostrophises the 'wondrous worm, self-shrouded in thy silken tomb! Anon to emerge in brighter form, on higher life intent; but that stern man thy mystic transformation intercepts, with fatal fires, consuming tenant for the sepulchre.'

"The results of all the most approved modes of rearing the silkworm and preparing the cocoons were exhibited, and might be studied with advantage, in the Crystal Palace.

"The *Bombyx mori* having been bred and reared under the special care and management of man during a long succession of ages, may be regarded as a domesticated species of insect; and it has become the subject, as the higher domesticated races, of varieties, of which those called 'Sina,' 'Syrie,' and 'Novi,' in France, are examples.

"The 'Sina' variety of the silkworm is known and esteemed for the pure whiteness of its silk, the thread of which is fine, but weak, and not very lustrous. The 'Syrie' variety is of large size, produces a cocoon abundant in silk, but the thread is rather coarse, and inclines to a greenish tint. The 'Novi' race is small, but the cocoons are firm and well made, and the silk has a yellowish tint.

"The specimens of cocoons and raw silk exhibited in the French department were numerous, and the degrees of excellence hardly to be discriminated in the finest examples selected for the award of the prize medal. With regard to the superior quality of these raw silks and cocoons, the Jury, by their recommendation of the award of the Council medal to the 'Central Society of Sericiculture of France,' desired to testify their admiration of the specimens exhibited by many members of that Society, and their appreciation of the important influence which it has exercised in the improvement of this beautiful and valuable product of the animal kingdom.

"The Jury, however, justly gave the honour of their first notice to the beautiful specimens shown under No. 782, by Major Count de Bronno Bronski, exhibitor of unbleached silk and silk cocoons from the Château de St. Selves, near Bordeaux, Department de la Gironde. The cocoons were remarkable for their large size and regularity of form, and the silk for the unusual length of the thread, its natural pure white colour, its fineness, and lustre. The circumstances under which this superior quality of silk was obtained are certified in a report by a Committee of the Agricultural Society of the Gironde, dated 28th April, 1847, to be as follows:—'In 1836 Major Bronski reared separately the eggs of the three varieties, 'Sina,' 'Syrie,' and 'Novi.' In 1837 he set apart the cocoons of the varieties 'Syrie' and 'Novi;' and on the exclusion of the imago or perfect insect, he associated the males of the 'Novi' with the females of the 'Syrie;' and the hybrid ova were hatched at the ordinary period in 1838, the operations being repeated in 1839 and 1840. With regard to the race 'Sina,' M. Bronski, in 1837, separated the white from the black

worms as soon as they were hatched. He then selected the largest and best shaped cocoons, and made a special collection of the eggs from the moths excluded from those cocoons. This procedure was repeated in 1838 and 1839; but in 1840 he associated the males excluded from the large cocoons of the black worms with the females excluded from those of the white worms. In 1841 he associated the males of the 'Sina' race with the hybrid females obtained from the above described crossings of 'Novi' and 'Syrie' breeds.' By these and similar experiments M. Bronski at length appears to have succeeded in obtaining a race of silkworms not subject to disease, producing large and equal-sized cocoons of a pure white colour, the silk of which was equal in all its length, strong, and lustrous, and presenting an average length of thread of 1057 mètres.

"Very beautiful examples of raw silk were also transmitted from diffe-ent parts of Italy; and amongst the Italian silks the first mention was due to those exhibited in Tuscany, which showed well all the desirable qualities of the cocoons and thread. From these the Jury selected for he award of the prize medal No. 51, exhibited by Professor Savi, of Pisa, or the specimens of raw silk from silkworms fed upon leaves of the Philippine mulberry. In the department of Sardinia the Jury selected as deserving, for their excellent qualities, the prize medal, the silks exhibited by Messrs. H. Jacquet and Co., Messrs. Casissa and Sons, and Messrs. Rignon and Co.

"Many of the silks exhibited in the department of Turkey were of a ery fine character, exhibiting a good length of thread, with the qualities f fineness, strength, elasticity, and lustre. The Jury had great pleasure n awarding the prize medal to the School of Sericiculture at Broussa, as vell as to some private exhibitors from Turkey.

"Very fine examples of silk were shown in the Indian department, rom which the Jury selected, as meriting the prize medal, the following: —D. Jardine, of Calcutta; Watson, of Surdah, Bengal; Mackenzie Bro-hers, of Bengal; Jennings, of Commercolly; W. M'Nair, of Surdah, Bengal. Besides the silk from the ordinary silkworm (*Bombyx mori*), alled in India *pat*, specimens of stronger and coarser kinds of silk were hown, from the *tussur*-moth (*Saturnia mylitta*), which feeds on the leaves f the *terminalia catappa* and *zizyphus jujuba*. The cloth woven from this lk is called 'tussur-cloth,' and is made at Midnapore. The moonga silk from the *Bombyx saturnia*, which feeds upon the same trees as the ussur. A piece of moonga-silk cloth, made in Assam, was exhibited. he *Phalæna cynthia* produces the *eri* silk. This species feeds upon the *icinus communis*. The eri cloth is also woven at Assam. It is observed n India, that the *pat*, or true silk, from larvæ of the *Bombyx mori* fed on ulberry-trees grown in a strong clay soil, is generally better, the cocoons eing larger and of better colour.

"In the Chinese department the quality of the silk developed in the ative country of the silkworm was worthily illustrated by the specimens xhibited by Yun-kee, of Shang-hae; to whom the Jury, therefore, djudged the prize medal.

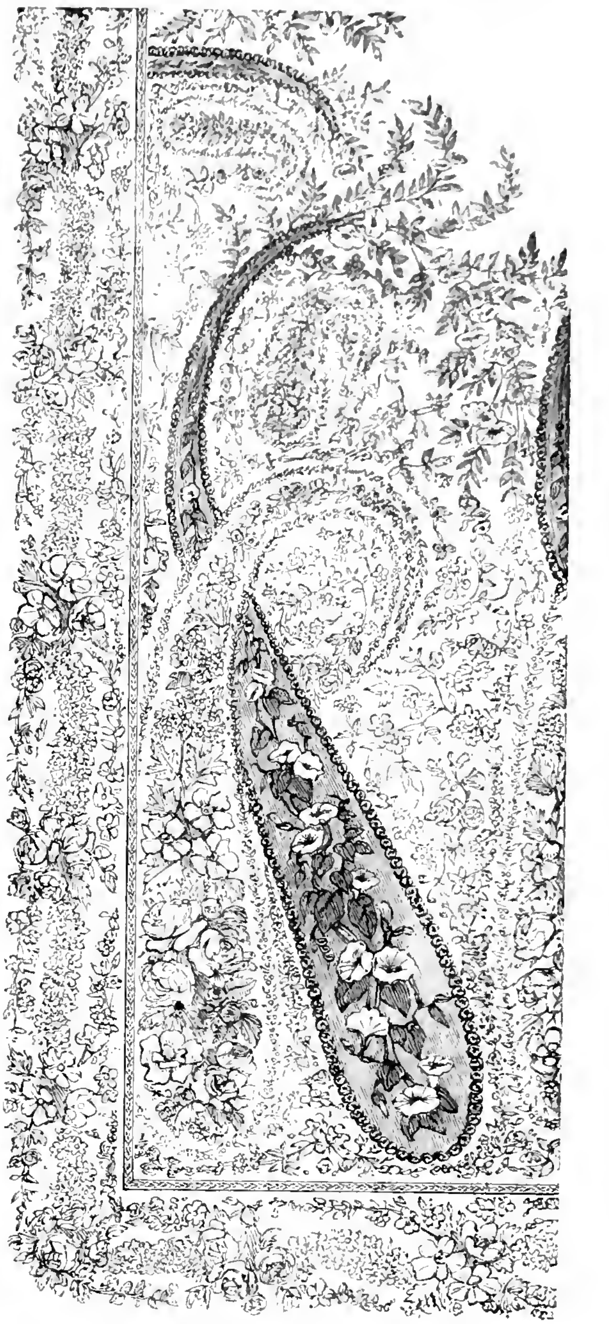
"I must not quit the subject of silk without, finally, offering a tribute f praise to specimens of silk, from silkworms reared on leaves of the hite mulberry, at Godalming, Surrey, and exhibited by Mrs. Catherine odge, which, considering the unfavourable conditions of climate, showed ualities that deservedly elicited the award of Honourable Mention from ur Jury."

SILK MANUFACTURES.

HERE were few departments of the Exhibition which were examined with ore interest than that of the silk manufacture, since it was one of those which the well-known reputation and long tried skill of our French eighbours promised to subject us to the severest test. Many well-meaning d intelligent people believed that, as regards our silk trade, if in no other epartment of manufacture, the Exhibition would have had a fatal ten-ency; since it would inevitably have shown us the poverty of our own oductions, especially in an artistic point of view. Spitalfields was luke-arm, if not positively hostile. Macclesfield could not see its way until the eventh hour; and it was only the fear of being absent, and thus suffering dgment to go by default, that led to any movement in either of these calities. Manchester and Coventry had some hopes that there might be ints in which they might excel, and consequently set about the work th more spirit and determination, and the fullest possible intention of inning if they could, but, if beaten, that it should not be for want of a trial. Without claiming for our silk manufacturers any super-excellence either taste or judgment, it is not too much to say that there are points in which ey certainly stand pre-eminent; and when the question of quality is scussed, no one need fear for the results. Of late years there has been constant tendency to avoid the production of decorated silks, and to pay ore and more attention to those of a plain character. This has arisen ce the period at which the restrictive duties were taken off French silks; d the manufacturer, who formerly depended upon his clandestine means obtaining patterns of these foreign productions, and using them as signs for his own trade, was compelled to forego his piracies, and depend on some original source. Now, unfortunately, he had altogether neglected e cultivation of the taste and talent around him; and in his hour of need e slender artistic means which he had been compelled to provide for the rpose of copying, failed him as a source of that originality by which alone could hope to stand.

The disquietude, therefore, of the silk manufacturers of this country, and re particularly of Spitalfields, is to be accounted for in the fact that they re totally unprepared for such a competition as that in which they were called upon to take part; and having been so long used to depend upon others rather than upon themselves, they were certainly not in the best possible condition to exert themselves with any effect.

The display actually produced, however, only served to prove how much more might have been done had this habit of self reliance been cultivated a little earlier, and the innovations of taste been regarded rather as a means

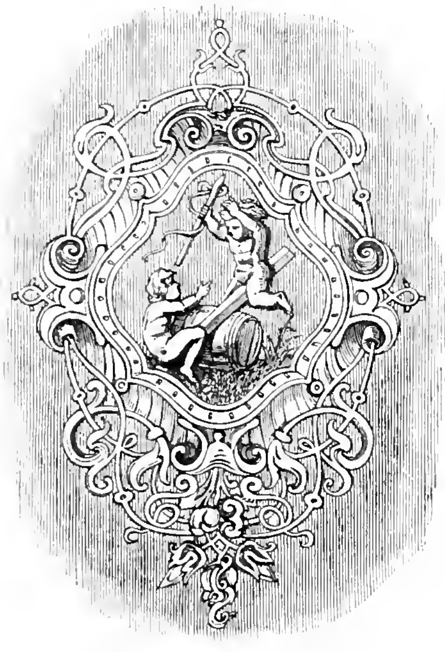


SHAWL PATTERN.—JAMESON AND BANKS.

whereby an extension could be given to trade, than as ruinous to certain exclusive interests which were never, after all, really benefited by the so-called protection afforded by antique restrictions.

The examples of British silk manufacture occupied the gallery immediately at the head of the first staircase on the south side. The Spitalfields or metropolitan silks, and the Coventry ribbons, were displayed in glass cases next the nave, and the Macclesfield and Manchester productions in a parallel line on the other side of the staircase. Nearly every class of silk goods was represented, and manufacturers, wholesale and retail dealers, were strangely enough found in competition, or at least in comparison, with each other. Messrs. Campbell, Harrison, and Lloyd, of Friday-street, City, exhibited some excellent specimens of figured moiré antique damask, rich brocades, and velvets. Stone and Kemp, Spital-square a rich assortment of plain and fancy silks. Isaac Boyd, some admirable specimens of silk

furniture damasks: and other houses kept up the reputation of Spitalfields for parasol silks, gros-de-Naples, satins, and velvets. Two specimens exhibited by the Spitalfields School of Design, as the production of pupils of that institution, were practical illustrations of its utility when properly directed. The crowning representation, however, of Spitalfields, was the silk trophy, set up by Messrs. Keith, in the central avenue. This richly-clothed and decorated object formed a decided feature of the Exhibition, and consisted of a parallelogram of mirrors with a wing at each of the angles, on which were draped the richest furniture damasks in well-selected and effective colourings. The structure was divided into three tiers, and rose to the height of forty feet, above which were placed the flags and banner. The lower tier displayed the broad silks of the largest patterns; and at certain angles these were reflected in the mirrors; whilst selections of silks were arranged upon a plinth which supported the whole, an ornamental *fascia* completing the first compartment. From this rose the second tier, in which, however, too many silks were crowded, and the effect was impaired in consequence. Great credit is due to Messrs. Keith and Co. for the spirit and energy they displayed in taking up this costly illustration of their trade single-handed; and the examples of silk of which it was formed are, with a few exceptions, equally creditable to their skill and taste as manufacturers.



DESIGN WOVEN IN SILK.—HOULDSWORTH AND CO.

Messrs. James Houldsworth and Co. were the exhibitors of silk from Manchester. Their specimens were all of a very high character. The large silk banner which occupied the centre of their compartment was executed specially for the Exhibition, and was composed of silk grown and manufactured in England. It was intended as a memorial of the late Mrs. Whitby, of Newlands, Southampton, who devoted so large a portion of her time and fortune to the promotion of the growth of silk in England, and was manufactured by Messrs. Houldsworth for her friend, Mrs. Wist.

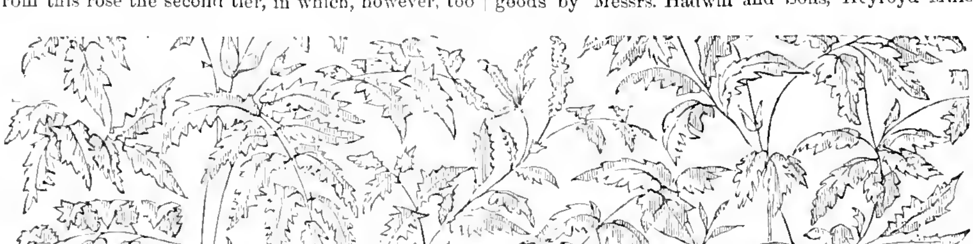
The embroideries by machinery, for which Messrs. James Houldsworth and Co. have been so long noted, were here displayed in all their accuracy of "repeat" and brilliancy of effect. Indeed, in all departments of the manufacture, this house sustained its reputation in a most satisfactory manner, the arrangements of the display being at once tasteful and effective.

Messrs. Whitworth and Proctor's specimens, of a totally different class from those last quoted, were very admirable. Messrs. Harrop, Taylor, and Pearson's goods, which filled a glass case of similar design to that of Messrs. Whitworth and Proctor, thus balancing the arrangement on each side of Messrs. Houldsworth, were of a class for which Manchester is noted—plain silk goods of excellent quality at a comparatively low price; and it was as specimens of this class only that they were exhibited.

At the back of the Manchester specimens, a miscellaneous collection of examples in silk and silk manufactures was placed. In the centre, and occupying the largest portion, were some very excellent examples of furniture damasks, manufactured and exhibited by Mr. William Grosvenor, of Kidderminster. The other exhibitors comprised those from Leek and Derby; and an interesting case of illustrations of the growth and pro-cess of silk manufacture, from the eggs of the silkworm to the finishe goods by Messrs. Hadwin and Sons, Heyroyd Mills, near Halifax; wit specimens of dye silks by Holdfort and Sons, of Leeds

DESIGN WOVEN IN SILK.—HOULDSWORTH AND CC

The Macclesfiel exhibitors wer grouped togethe in a large glass cas at the head of th stairs; and the spe cial productions o that town wer worthily represen ed by Messrs. Bro klehurst and Son H. and T. Wardl and Co., and Critel ley, Brinsley, an Co.; ladies' sil handkerchiefs an small silk shaw being the leadin features. Of th colouring of man of the specimen we can speak in th highest terms o commendation.



SILK PATTERN.—HOULDSWORTH AND CO.

RIBBONS.

THE staple produ tions of the ancie city of Coventr as already state occupied a prom nent situation i the Central Sout Gallery, next t the nave, and we displayed in a lon glass case, of mo pretension to arch tectural beaut than was realise in its constructio Of the display here made it is only right to premise, that Coventry ha hitherto aimed at manufacturing cheap ribbons, in which great effect obtained at the smallest possible amount of labour and the minimum qua tity of material; and the examples here shown were, with very few excep

tions, intended to illustrate the regular manufacture of the various houses who united to make this exposition of the ribbon trade. Each of the leading firms was represented, and each had evidently endeavoured to display the leading features of its own special trade. Thus, Messrs. Sturdy and Turner exhibited samples of ribbons remarkable for beauty of design and the application of steam power to their manufacture; and Messrs. Sharpy, Odell, and Jur exhibited illustrations of a medium quality of goods manufactured at Coventry. In order, however, to show how far the ribbon weavers of Coventry are capable of going beyond the ordinary character of goods upon which they are usually employed, and by the manufacture of which the commercial status of that city is kept up, it was wisely resolved, by a few spirited individuals, that a ribbon should be manufactured, and the cost of its production be defrayed by subscription, in order to ensure the production of such a specimen as would prove the capability of the Coventry workmen to produce better things than they usually have credit for, and to show that the element of price was always to be considered in the production of excellence. The ribbon thus manufactured, under the especial superintendence of a committee of manufacturers appointed for that purpose, was exhibited in the central compartment of the glass case which was set apart for its display, in a variety of colourings. Unfortunately, wood engraving would give no adequate representation of the special beauties of this example; an illustration would, therefore, be useless, as its colourings, and the arrangement of its parts for the purposes of weaving, constitute the primary elements of its excellence; and, without believing that it is the very perfection of design and workmanship in ribbon manufacture, it was extremely interesting, as showing how far the energies and talent of our countrymen may be developed by judiciously-exercised encouragement, and the stimulus of an extraordinary circumstance, such as this Exhibition has proved to many of our manufactures. Let the Coventry men take a lesson from this, and, indeed, the Spitalfields men might do the same: and let them take care to produce at least one first-rate specimen of their skill every year for the future, as a point of perfection at which their artisans should aim as far as possible, even in their ordinary productions.

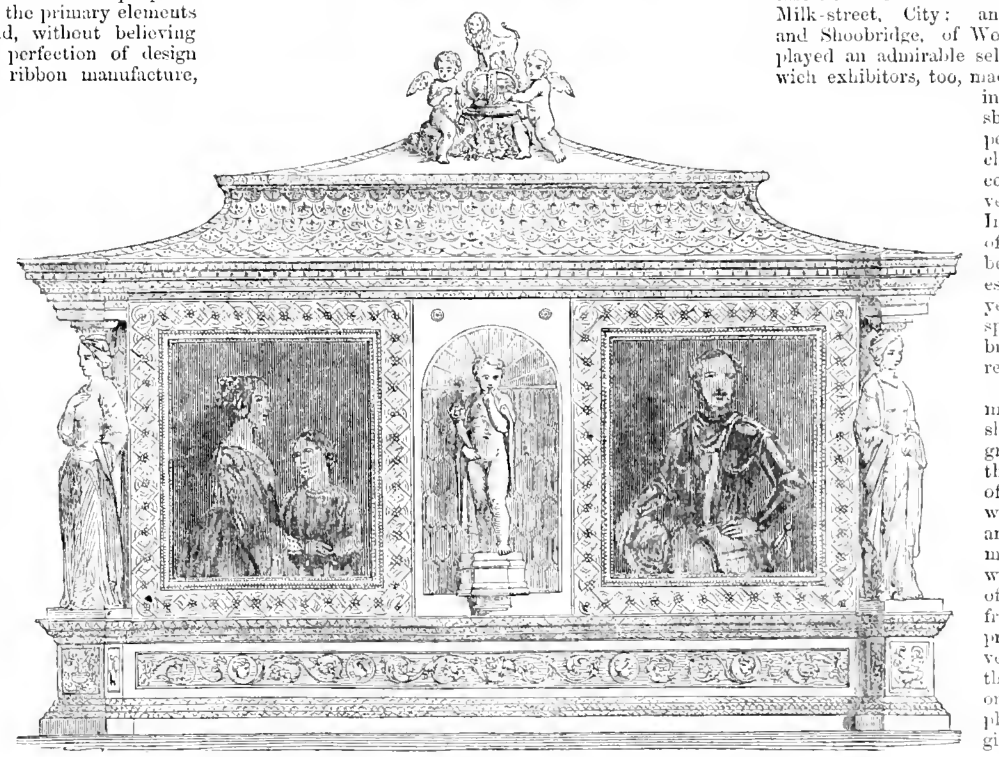
SHAWLS.

The valuable and interesting display of British shawls was most judiciously arranged in the gallery on the south-western side of the transept, the London and Norwich contributions being placed in a series of elegantly-designed glass cases; and those of Paisley in suitable compartments, either covered with glass or open, according to the character of the goods. When the great variety of production in this department of textile fabrics alone is taken into consideration, and it is remembered that the design may range from the most intricate India prize patterns to the most primitive of plaids, and yet present decided features of excellence *per se*, the importance of its complete illustration will be at once acknowledged. Nor is this application of the arts of design to be confined exclusively to the production of the patterns by the loom alone, since, of late years most important improvements in the decoration of shawls have been effected by the application of printing by blocks; and the success which has attended this method was fully exemplified by the very beautiful and unique specimens exhibited by Mr. Charles Swaisland, of Crayford, Kent, one of the last of those London printers whose reputation has been eclipsed by the mechanical contrivances and rapid methods of production of their Lancashire rivals. The *barège* shawls of this unrivalled printer have long held the command of the market: and the selection exhibited will only serve to enhance the reputation acquired by the experience of nearly half a century.

Messrs. Kerr and Scott, of St. Paul's Church-yard, exhibited largely and in great variety, alike in printed and woven fabrics. Messrs. Webber and Hairs, of Milk-street, City: and Messrs. Keith and Shoobridge, of Wood-street, also displayed an admirable selection. The Norwich exhibitors, too, made a most interesting display in both shawls and figured poplins, brocades and chinés. The Paisley contributions were very extensive. The Indian long shawls of Mr. R. Kerr have been held in high esteem for many years past, and the specimens he exhibited sustained his reputation.

The gay colours of many of the tartan shawls and plaids grouped well with the more sober hues of the fancy plaids in which tertiary tints and neutrals are admirably contrasted with the vivid colours of broad borders and fringes. Many of the printed shawls were very excellent; and the embroidered ones, though out of place here, served to give effect to those around.

ENAMELLED GOLD VASE.—SEYMOUR AND SON.



HER MAJESTY'S CINQUE-CENTO JEWEL-CASE.—DESIGNED BY GRUNER; MANUFACTURED BY ELKINGTON.

JEWEL-CASE, IN THE CINQUE-CENTO STYLE.

This magnificent jewel-case, the property of her Majesty, was designed by L. Gruner, Esq., and executed at the manufactory of Mr. Henry Elkington, at Birmingham. The material is bronze, gilt and silvered by electrotype process. Upon this case are portraits on china of her Majesty, H.R.H. Prince Albert, and H.R.H. the Prince of Wales, copied from miniatures by R. Thornburn, Esq., A.R.A. The small medallions, representing profiles of their Royal Highnesses the Princes and Princesses, were modelled from life by Leonard Wyon, Esq.

GOLD VASE. BY SEYMOUR AND SON.

This vase bears enamelled portraits of the Queen and Prince Albert, in imitation of cameos. The transparent enamel colours on the body of the vase are the red or ruby-coloured enamel, green, and blue; in the neck is the turquoise-coloured enamel. These colours are all made by the exhibitors, and may safely challenge comparison with anything of the kind ever produced; the ruby colour in particular is perfect. The portraits are painted by J. Haslem.

THE RAILWAY DEPARTMENT.

RAILWAY PLANT.

A LARGE outlay is required annually in providing the plant or furniture of every railway, and for keeping the same in repair, as almost every kind of railway appendage is subject to a considerable amount of friction, and, consequently, daily deterioration in point of value. To illustrate this, we need only call attention to the wheels, the axles, and, indeed, to almost every other part of the engines and carriages used on the "iron way;" added to which, the rapid decay of the sleepers, fences, and other woodworks partially buried in the ground, notwithstanding the kyanising and other supposed preservative applications, as well as the great amount of friction to which the rails are continually subjected, render it quite necessary that every improved and more durable form of rails, wheels, and other parts of the stationary and rolling-stock respectively, should receive the utmost attention of railway directors, whose especial care it should be to remember continually that the shareholders' half-yearly dividends depend a great deal on this important branch of railway economy.

In addition to the locomotive engines, which we have already described, there were upwards of one hundred contributions in this department, including railway carriages and models, different kinds of permanent way, various patterns of wheels, besides new forms of turntables and traversers, and several new modes of giving signals and applications of the break, besides switches and crossings, lifting-jacks, and locomotive fittings generally.

Railway carriages, with regard to internal arrangements, have undergone but very little change since 1836, for we find, in Whishaw's "Analysis of Railways," the following with regard to the carriages at that time employed on railways:—

"The most approved forms of carriages are the first class on the Manchester and Liverpool Railway, which are divided into three compartments, each containing ample room for six persons; the extreme length of each is 14 feet, and the width 7 feet. The second-class carriages are open at the sides, and have seats for twenty-four persons. The Stockton and Darlington Railway carriages are divided into three compartments; the middle one is closed, and the other two are open: the extreme width is 5 feet 9 inches; the internal height, 4 feet 8 inches; and the width of each seat, 16 inches: the wheels are four in number, and 2 feet 7 inches diameter. Some of the carriages on the Greenwich Railway are of the size usually adopted, but are without the divisions, having seats all round, except where the doors intervene."

For the narrow-gauge lines nothing certainly could have been more comfortable than the first-class carriages of the Manchester and Liverpool Railway, as above described. The second-class, however, were anything but luxurious in bad weather, and people were inclined to compare them with the outside seats of a stage coach, and to prefer the latter, which were at any rate free from the cutting draughts of air rushing violently through the side openings. In this respect a great change has taken place for the better, as we find the comforts of second-class passengers more attended to on some railways; and, instead of the open sides, windows have been added. The "composite carriage" of the Stockton and Darlington line of 1836 served as a pattern for the carriage builders of 1851, and is a particularly convenient and indeed economical form for branch lines; the middle compartments being for first-class, and the two end compartments for second-class passengers respectively.

The general form of the Greenwich Railway carriage of 1836 is still preserved by the South-Eastern Railway for the North Kent line, with a different arrangement, however, of the seats within, which enables the grasping managers of the line to cram the different carriages to suffocation, without regard to the class of passengers. The South-Eastern carriage, built by Adams, and exhibited in the railway department of the World's Fair, is, however, on the old and more convenient plan, giving to every first-class passenger his own seat, and also allowing a fixed space for so many second class passengers. The peculiarity of this carriage, which has been styled the "carriage of all nations," is, that it consists of a vertebrated body, running on eight wooden wheels, of Mansell's patent construction, and affording accommodation altogether for eighty first and second class passengers. The panels and doors, &c. are of teak-wood, varnished. Adams' patent springs and grease-tight axle-boxes have also been adopted: by a mechanical arrangement, the fore and hind parts of this lengthy vehicle, the one for first and the other for second-class passengers, may be so placed in passing curved portions of a line of railway, that the two pairs of wheels on each side, instead of being in one and the same plane, move at an angle to each other according to the degree of curvature. This carriage was built by Brown, Marshall and Co., and is according to Mr. Adams' patent, who exhibited also a carriage, in connexion with his light passenger engine, as a specimen of his mode of economically working branch lines: thus, he dispenses with one pair of wheels, and underneath the carriage he places a tank of water for the supply of the engine boiler.

Mr. Williams, the well-known railway-carriage builder, sent a very handsome first-class passenger carriage, the great novelty of which is the entire absence of paint; all the panels, doors, and other parts of the body being constructed of East India Moulmein teak, well coated with varnish, which brings out the grain of the wood, and altogether produces an elegantly neat appearance. This style of external construction has been adopted for the Royal carriages of the Great Northern Railway.

Mr. M'Connel, the locomotive superintendent of the North-Western Railway Company, contributed a novelty in carriage building to the Great Show. He makes the body of corrugated iron, which must be very strong and durable, and we should imagine, on the whole, economical. This carriage is mounted on six wheels, and is of the composite order; consisting of two first-class compartments; five second-class compartments, and one guard's compartment: a foot-board extends the whole length on either side: it is furnished with Brown's patent buffers; and the exhibitor states that the whole is fire and water-proof—a most important consideration.

H. H. Henson, also attached to the North-Western Company's extensive establishment, exhibited a luggage van on four wheels, the body with sliding doors, being of similar construction to that of the carriage last described, which is certainly a step in the right direction, as we often hear of sad havoc from fire among the merchandise waggons of railways.

We have heard of sheet iron panels for carriage bodies, for such were adopted for the Belgian railways long ago, but, until now, *papier mâché* panels have not been introduced. The framework of a railway carriage with panels of this material was exhibited by J. C. Haddon. There is no doubt but that *papier mâché* is a most convenient material for moulding into any particular form that may be required, and when painted will resist wet; but as fire must now be guarded against in the construction of railway carriages, we should certainly prefer the construction adopted by Mr. M'Connel and Mr. Henson, or the flat metallic panels of the Belgian railway carriage builders.

G. Grey, of Birmingham, exhibited an "improved railway break and signal vans," consisting of three small vans separated from each other by spring buffing apparatus, and having also terminal buffers; the whole mounted on six wheels. In cases of collision such a carriage placed in front, and a second one in the rear of a train would, no doubt, prevent many broken noses and shattered foreheads.

In addition to the full sized carriages, we found six contributors of model carriages—exhibited either for novelty of design or some new arrangement of parts. The names of the exhibitors of these models are —B. Tennant, W. N. Cripps, W. Machay, C. Chabot, the zincographer, W. Green, and R. Welling, jun., the well-known carriage-builder, of Manchester. The only one of them which we shall notice is the last-mentioned; as at this time Royal progresses are so frequent, that it becomes necessary to provide every accommodation possible for those so beloved as the Queen of England, her highly-gifted Consort, and their illustrious children. The external design of Mr. Welling's model of a Royal state railway carriage is far better than the internal arrangements. A promenade extends entirely round the carriage, properly railed in—thus affording an opportunity to the Royal travellers, occasionally, to enjoy the picturesque while getting a breath of fresh air. The interior is spoiled by the irregular shape of the saloon—owing to the entrances projecting within the sides of this compartment; while the accommodation in the shape of retiring rooms seems to have been little thought of.

In connexion with carriages, there were several contributions in the shape of improved buffers, breaks, couplings, axles, wheels, and tires. The names of the contributors of the articles included in this classification are—Fossick and Hackworth, of Stockton-on-Tees, C. De Bergue, and T. C. Clarkson, who severally exhibited improved buffers; and the first-named, an improved draw-spring. Buffers are made in a variety of ways; for waggons and common carriages they are often made of wood, neatly covered with leather, and padded; then for better kinds of carriages they are constructed of India-rubber, metallic springs, and various kinds of material, according to the particular notion of the inventor.

Next to buffers, we found six exhibitors of breaks, including W. M'Naught, J. Lee, J. Dillon, W. Handley, W. Walker, and H. Stoy. Most of our readers will have experienced, travelling by railway, not only the unpleasant sensation produced by the vibrations of the carriage, owing to the sudden application of that useful appendage to a railway train, but also an unpleasant effluvium, arising from the charring of the wood chock. Of late these distressing effects have been much diminished; and it should be the endeavour of all managers of railways to produce the necessary breaking or scotching of the wheels uniformly throughout the train, which is thus more easily and speedily brought to a state of rest. Most of the breaks in ordinary use produce not more than an inch of friction, or rubbing surface on the rails, which must speedily destroy the wheels and rails.

Mr. Lee's breaks possess a power of stopping the trains of 18 to 1 over those breaks to which we have alluded, and act directly from the axle and box of the wheels with a wedge-shaped shoe, which presents one surface to the wheel, and another to the rail, the latter extending to 18 inches. These breaks are brought into action by the application of a powerful screw by one revolution, while by an additional half turn of the screw, the whole weight of the carriage is thrown upon the wedge-block, thus raising the wheels *one sixteenth of an inch* above the rails, but no more; thus the wear of the tyre and rails is avoided.

THE GREAT EXHIBITION.—WESTERN NAVE—LOOKING WEST; INCLUDING THE COALBROOK DALE DOME, DENT'S TURRET CLOCK, MRS. ROSSE'S STONE CROSS, &c.

LECTURES ON THE GREAT EXHIBITION.

WE resume our perusal of the Lectures delivered before the Society of Arts on the results of the Great Exhibition, as regards different branches of Industry; extracting a few passages which are interesting from the novelty or force of the lessons contained in them.

ALLIANCE OF SCIENCE WITH INDUSTRY.

DR. LYON PLAYFAIR, in his Lecture "On the Chemical Principles involved in Manufactures, as indicating the necessity of Industrial Institutions," says:—

"I have shown in my former lecture, that a rapid transition is taking place in industry; that the raw material, formerly our capital advantage over other nations, is gradually being equalised in price, and made available to all by the improvements in locomotion; and that industry must in future be supported, not by a competition of local advantages, but by a competition of intellect. All European nations, except England, have recognised this fact; their thinking men have proclaimed it; their governments have adopted it as a principle of state; and every town has now its schools, in which are taught the scientific principles involved in manufactures, while each metropolis rejoices in an industrial university, teaching how to use the alphabet of science in reading manufactures aright. Were there any effects observed in the Exhibition from this intellectual training of their industrial populations? The official reserve, necessarily imposed upon me as the Commissioner appointed to aid the Juries, need exist no longer, and from my personal conviction, I answer without qualification, in the affirmative. The result of the Exhibition was one that England may well be startled at. Wherever—and that implies in almost every manufacture—Science or Art was involved as an element of progress, we saw, as an inevitable law, that the nation which most cultivated them was in the ascendant. Our manufacturers were justly astonished at seeing most of the foreign countries rapidly approaching and sometimes excelling us in manufactures, our own by hereditary and traditional right. Though certainly very superior in our common cutlery, we could not claim decided superiority in that applied to surgical instruments: and were beaten in some kind of edge-tools. Neither our swords nor our guns were left with an unquestioned victory. In our plate-glass, my own opinion—and I am sure that of many others—is, that if we were not beaten by Belgium, we certainly were by France. In flint-glass, our ancient *prestige* was left very doubtful, and the only important discoveries in this manufacture were not those shown on the English side. Belgium, which has deprived us of so much of our American trade in woollen manufactures, found herself approached by competitors hitherto almost unknown; for Russia had risen to eminence in this branch, and the German woollens did not shame their birthplace. In silversmith work we had introduced a large number of foreign workmen as modellers and designers, but, nevertheless, we met with worthy competitors. In calico-printing and paper-staining our designs looked wonderfully French; whilst our colours, though generally as brilliant in themselves, did not appear to nearly so much advantage, from a want of harmony in their arrangement. In earthenware we were masters, as of old: but in china and in porcelain our general excellence was stoutly denied; although individual excellencies were very apparent. In hardware we maintained our superiority, but were manifestly surprised at the rapid advances making by many other nations. Do not let us nourish our national vanity by fondly congratulating ourselves that, as we were successful we had little to fear. I believe this is not the opinion of most candid and intelligent observers. It is a grave matter for reflection, whether the Exhibition did not show very clearly and distinctly that the rate of industrial advance of many European nations, even of those who were obviously in our rear, was at a greater rate than our own; and if it were so, as I believe it to have been, it does not require much acumen to perceive that in a long race the fastest-sailing ships will win, even though they are for a time behind. The Exhibition will have produced infinite good, if we are compelled as a nation to acknowledge this truth. The Roman empire fell rapidly, because, nourishing its national vanity, it refused the lessons of defeat, and construed them into victories. All the visitors, both foreign and British, were agreed upon one point, that, whichever might be the first of the exhibiting nations, regarding which there were many opinions, that certainly our great rival, France, was the second. Let us hope that in this there is no historical parallel. After the battle of Salamis, the generals, though claiming for each other the first consideration as to generalship, unanimously admitted that Themistocles deserved the second; and the world, ever since, as Smith remarks, has accepted this as a proof that Themistocles was, beyond all question, the first general. Let us acknowledge our defeats when they are real, and our English character and energy will make them victories on another occasion. But our great danger is, that, in our national vanity, we should exult in our conquests, forgetting our defeats; though I have much confidence that the truthfulness of our nation will save us from this peril. A competition in Industry must, in an advanced stage of civilisation, be a competition of intellect. The influence of capital may purchase you for a time foreign talent. Our Manchester calico-printers may, and do, keep foreign designers in France at liberal salaries. Our glass-works, may, and do, buy foreign science to aid them in their management. Our potteries may, and do, use foreign talent both in management and design. Our silversmiths and diamond-setters may, and do, depend much upon foreign talent in art and foreign skill in execution; but is all this not a suicidal policy, which must have a termination, not for the individual manufacturer, who wisely buys the talent wherever he can get it, but for the nation, which, careless of the education of her sons, sends our capital abroad as a premium to that intellectual progress which, in our present apathy, is our greatest danger?

"It is well to inquire, in what we are so deficient, and what is the reason of this deficiency. Assuredly it does not consist in the absence of public philanthropy or want of private zeal for education, but chiefly rests in that education, being utterly unsuited to the wants of the age. In the thirteenth and fourteenth centuries classical learniog was, after its revival, highly esteemed: and its language became the common medium for expression in all nations. A thorough acquaintance with it was an absolute necessity to any one with pretensions to learning. It had a glorious literature, one as fresh as when it grew on the rich soils of Rome and Greece. Its truths were eternal, and were received by us in their traditional mythology, as Bacon beautifully says, like "the breath and purer spirit of the earliest knowledge floating to us in tones made musical by Grecian flutes." And why was that bewitching literature made the groundwork of our educational systems? Does it not show that literature, like art, may have a standard excellence; and that we are content to imitate where we cannot surpass. If the main object of life were to fabricate literati, I would not dispute the wisdom of making classics the groundwork of our education. They are not utterly dead, but, like the dry bones of the valley, they may come together, and have breathed into them the breath of life. In the world there is a constant system of regeneration. Theories exist for a time, but like the phœnix, are destroyed, and rise yet more glorious from their ashes. Animals die, and by their decay pass into the atmosphere, whence vegetables derive their nutriment, and thus death becomes the source of life. But in all this there is no incongruity. A phœnix does not from its ashes produce an eagle, but a phœnix as before. The dry bones of dead Literature may vivify into new forms of literary life. Classical Literature and exact Science are, however, wholly antithetic. If Classical Literature be sufficient to construct your spinning-jennies and bleach your cottons, your system of instruction is right; but if you are to be braced, and your sinews strengthened, for a hard struggle of industry, is it wise that you should devour poetry, while your competitors eat that which forms the muscles and gives vigour to the sinews? With such different trainings, who in the end will win the race? Science has not, like Literature and Art, a standard of excellence. It is as infinite as the wisdom of God, from whom it emanates. All ordinary powers decrease as you depart from the centre; but the power of knowledge augments the farther it is removed from the human source from which it was transmitted. God has given to man much mental gratification in trying to understand and apply to human uses His laws. The great philosopher of Scripture has said, 'It is the glory of God to conceal a thing, but the honour of kings to search out a matter.' The poet-prophet of the Bible has also told us, that God 'turneth wise men backward, and maketh their knowledge foolish.' And, therefore, as surely as He is infinite and man finite, until earth passes away, you will have no human standard of scientific knowledge. As this is so, how can we as a nation expect to carry on those manufactures by our sons of Industry, when we do not teach them the nature of the principles involved in their successful prosecution? Solace ourselves as we will with vain thoughts of our gigantic position among nations—Greece was higher than we are, and where is she now? It does not require a lofty stature to see the farthest; for a dwarf on the shoulders of a giant sees farther than the giant,—not that he is less a dwarf, but that he has added the giant's height to his own. The Exhibition showed us many small States which had thus raised themselves on the shoulders of Science within the last few years, while we are merely hovering about its skirts. Let us take care that our excess of pride in the so-termed 'practical' power of our population may not be punished as Arachne was of old. Arachne was wonderfully skilled in needle-work, but presumptuously challenged Minerva to a trial of skill. What chance was there in such an unequal contest? Minerva united Science to her handicraft skill, and this combination insured success. Arachne was justly cast from her proud position among mortals by being changed into a spider, ever spinning the same web in the same way,—the same for wintry blasts as for gentle summer zephyrs.

"'You have excelled all other people in the products of Industry. But why? Because you have assisted Industry by Science. Do not regard as indifferent what is your true and greatest glory. Except in these respects, in what are you superior to Athens and Rome? Do you carry away from them the palm in literature and the fine arts? Do you not rather glory, and justly too, in being, in these respects, their imitators? Is it not demonstrated by the nature of your system of public education and by your popular amusements? In what, then, are you their superiors? In everything connected with physical Science; with the experimental arts. These are your characteristics. Do not neglect them. You have a Newton, who is the glory, not only of your own country, but of the human race. You have a Bacon, whose precepts may still be attended to with advantage. Shall Englishmen slumber in that path which these great men have opened, and be overtaken by their neighbours? Say, rather, that all assistance shall be given to their efforts; that they shall be attended to, encouraged, and supported.'"—*Davy.*

AUSTRALIAN WHEAT.

FROM PROFESSOR LINDLEY'S Lecture on "Substances used as Food."

"If we take the subject of WHEAT, which, perhaps, will be regarded by many as paramount to all others, I think it will appear that there are some circumstances connected with this Exhibition which particularly deserve to

Mr. James Dillon's breaks are somewhat similar in their effect to those of Mr. Lee, but different in form—consisting of a long friction slide on each side and between the respective wheels. When the guard applies the necessary power, the slides are brought immediately to bear on the rails, and the carriages are slightly raised therefrom.

Handley's patent railway break is of wedge-form, and is applied to each wheel of the carriage to which the apparatus is fixed; so that the carriage may be brought to a stand when going in either direction.

G. Knox, of Tottenhall, near Wolverhampton, contributed a model of his break carriage, the buffers of which are formed of strong spiral springs. The chief object of this invention is to destroy or modify the effect of collisions by the interposition of one or more of such carriages in every train—each of such carriages being calculated to sustain a shock of 60 tons before any mischief could be done, either to itself, or any other carriage guarded by it. The breaks are readily applied by the guard in charge.

Many of the accidents which have from time to time happened to railway trains have been owing to imperfect axles; of late, therefore, much attention has been paid to producing axles of great strength, and which may be relied on.

The Patent Axletree Company exhibited specimens of their patent axles, and also contributed illustrations of the different stages of the manufacture.

The other exhibitors of axles were Messrs. G. B. Thornycroft and Co., the well-known Wolverhampton firm; Beechcroft, Butler, and Co.; Messrs. Worsdell and Co., the carriage builders of Warrington; J. Squire and Co.; and Messrs. Beechcroft and Co., in particular, exhibited not fewer than twenty-eight different kinds of axles steeled with hard metal bushes, case-hardened with milled bushes, &c.

There was a large display of railway carriage wheels, in most of which, however, we recognised the well-known double spoke pattern of the old house of Losh, Wilson, and Bell, Gateshead; or, at any rate, modifications thereof, though the mode of manufacture in some of the cases is entirely different from that practised by the Gateshead firm as above.

On our survey of the British railways some twelve years since, we found the wheels principally used throughout the kingdom were those of Losh, Hawks, Cottam, and Bramah respectively, all of wrought iron; Warrington's, of cast iron; and the Liverpool and Manchester wooden wheel, with wrought iron tires; there was also a perforated cast-iron disc wheel, but it was not extensively used.

The exhibitors of railway wheels were Sandford and Owen, of Rotherham; T. Spencer, of Tipton; Beechcroft, Butler, and Co., of Leeds; Banks and Chambers, of Manchester; F. Lipscombe, of London: Eastwood and Frost, of Derby; W. Wharton, of the Euston Station; and R. C. Marshall, of Ashford; J. C. Haddon, of London, whose *papier mâché* panels we have already mentioned, contributed railway wheels with wrought iron naves; and Greaves sent his patent wheels, having eight wooden spokes let into the nave at one end, and into cast-iron sockets forming part of the rim at the other. The appearance of these wheels is very similar to that of the Liverpool and Manchester Railway wooden wheel, already alluded to.

Messrs. Sandford and Co.'s wheel is of wrought iron, 3 feet in diameter, welded into one piece, and executed by machinery—a neat and safe production. Contiguous was one of their 3-feet 6-inch wheels, the spokes of which are welded to an inner rim, which is turned, and the tire shrunk on and secured in the ordinary manner.

Mr. Spencer, the manufacturer, exhibited Chamber's patent wrought-iron wheel, of eight spokes, four projecting from one side of the nave to the rim, and four on the other. This form possesses novelty, and is not deficient in strength.

Messrs. Beechcroft and Company, of the Kirkstall Forge, near Leeds, made a great display of wheels and axles in Class V. of the Great Exhibition; and in Class I, many specimens of railway tire-bar, bent cold, in forged state, to show toughness, soundness, and strength of material; to show fibre in fracture; to show mode of manufacture and soundness. In the same class they also exhibited the best double fagoted carriage axles, bent cold, to show toughness, soundness, and strength of material: and other axles, to show manufacture and soundness. But to return to their wheels in Class V. This firm contributed a variety of wheels for the purpose of showing those mostly used on railways at the present time; thus, we find wheels entirely of wrought iron 3 feet in diameter, some having single, and some double spokes—the boss, spokes, and rim being forged solid in one piece; these wheels are especially calculated for the carriages of fast and express trains. Then there were compound wheels, made of wrought iron and cast iron, of various constructions, calculated for ordinary trains. We also found wheels with wrought-iron disc centres, disked, flanged, and punched all at one process, by hydraulic pressure, the bosses being of solid wrought iron, and the tires dovetailed to the rims, which are flanged; thus the use of rivets is superseded.

The peculiarity of the wheels of Banks and Chambers is the insertion of steel segments in that part of the tire which is most exposed to friction; these segments are $2\frac{1}{4}$ inches wide, and $\frac{1}{2}$ inch thick, and are let into dovetailed chases.

The "silent" wheels of Mr. Lipscombe consist of the ordinary spokes being enclosed with sheet iron on either side, and the intermediate spaces filled in with wood. The inventor says the object he has in view is to prevent vibration while the wheels are in motion; "thus causing them to run without noise." Even if these advantages could be obtained, the additional expense will prevent their general adoption.

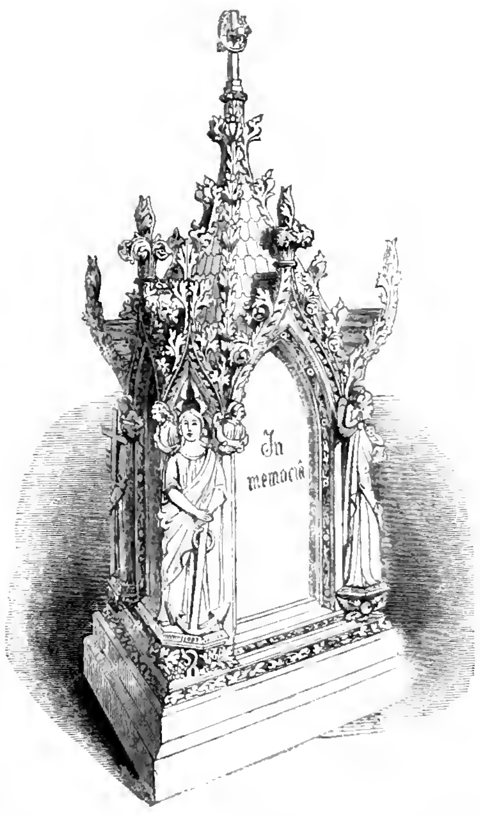
Eastwood and Frost exhibited a segment of a railway wheel produced from a rolled bar, with the boss, arms, and tire complete.

Mr. Mansell states that his wheel, which he designates a safety-wheel, has its tire so secured that no part of it can leave the wheel in case of breakage.

Mr. Haddon showed different kinds of wheels; those of nine spokes, made of straight bars turned down at their ends, to form a solid nave—the other end of each spoke being turned down to form a solid rim. Wheels of this pattern are manufactured by Fox, Henderson, and Co. Secondly, those with segmental bars; and, thirdly, compound rails of wrought iron and wood, the nave being of wrought iron, formed by swelling the ends of the spoke bars, the wood consisting of wedges driven in between.

DESIGN FOR A MONUMENT.

MR. Baker, a young artist, of Southampton, exhibited a new design for a monument, intended as an improvement upon the ordinary run of tombstones and mural tablets so much in vogue. It is a Gothic composition, intended to stand some 20 feet high, though the model is only 4 feet 3 inches high, and is of Caen stone. In form it is triangular, and at the



corners are figures of the cardinal virtues—Faith, Hope, and Charity; with appropriate texts from Scripture underneath each. On the principal panel the usual formulary—"In memory of"—is already inscribed, leaving only the name of the party to be inserted. Mr. Baker will, we have no doubt, find some patrons amongst those who have a taste for this sort of posthumous display: but, for our own part, we confess we think that art has been already too much misapplied in these matters; whilst nature, with a few simple everlastings and flowers, would afford a tribute from the living to the dead much more pleasing in effect, and much more congenial to sentiment. In a sanitary point of view, also, such a change would not be unimportant, it being now well ascertained that the planting of trees and flowers in burying-grounds is of positive service to the health of the neighbourhood.

brought under public consideration, and especially one which, although corn factors in Mark Lane are familiar with it, is by no means a matter universal notoriety—the high character and excellence of the wheat that mes to us from our South Australian colonies. There is now before us a mple of wheat from Adelaide, for which we are indebted to the kindness Messrs. Heath and Burrows, which is probably the most beautiful specin of corn that has ever been brought to market in any country. It is a ite wheat, in which every grain appears to be like every other grain ump, clear-skinned, dry, and heavy weighing, what may seem incredible those who are only accustomed to common wheat, seventy pounds a shel. And it appears that Adelaide is capable of yielding vast quantities corn of this description, which takes the lead in the markets of this untry over all other white wheats.

'It is very true that from Spain there has come a similar kind of wheat, great excellence also, as is seen by this beautiful sample from Castile, from e mayor of Medina del Campo, the weight of which is unknown, and not sy to estimate, because it is not a clean sample. This is certainly of great cellence also; but, independently of its being the produce of a foreign untry, it is almost inaccessible to us, and, therefore, a matter of curiosity ore than of practical value, because, owing to the difficulty of transport, cannot at present come into the markets of this kingdom. If it could, nsidering that it sells in Old Castile at 24*s.* a quarter, it is not easy to say at might be the effect upon the English market of the introduction of y large quantity of it. We find moreover, that similar quantities of wheat, owing in the same rich country of Spain, are vendible at much lower rates.

'I have already said, that among the wheats produced in the Exhibition, at from our South Australian colonies is the best—that it is much the st. And here let me make a remark on that subject. It has been supsed that all we have to do in this country, in order to obtain on our glish farms wheat of the same quality as this magnificent Australian corn, to procure the seed and sow it here. There cannot be a greater mistake. e wheat of Australia is no peculiar kind of wheat; it has no peculiar nstitutional characteristics by which it may be in any way distinguished om wheat cultivated in this country: it is not essentially different from e fine wheat which Prince Albert sent to the Exhibition, or from others hich we grow or sell. Its quality is owing to local conditions, that is to y, to the peculiar temperature, the brilliant light, the soil, and those other rcumstances which characterise the climate of South Australia, in which is produced; and, therefore, there would be no advantage gained by roducing this wheat for the purpose of sowing it here. Its value consists what it is in South Australia, not in what it would become in England. reality, the experiment of growing such corn has been tried. I myself tained it some years since for the purpose of experiment, and the result s a very inferior description of corn, by no means so good as the kinds nerally cultivated with us. And Messrs. Heath and Burrows, in a letter hich I have received from them this morning, make the same remark. ey say, 'For seed purposes it has been found not at all to answer in gland, the crop therefrom being ugly, coarse, and bearded.' The truth as was just observed, the peculiarities of South Australian wheat are t constitutional, but are derived from climate and soil. It appears, erefore, that wheat may be affected by climate, independently of its contutional peculiarities: but it does not follow that wheat is not subject to nstitutional peculiarities like other plants. There are some kinds of heat which, do what you may with them, will retain a certain quality, rying but slightly with the circumstances under which they are proced; as, for example, is proved by some samples here, especially of vitt wheat, of a very fine description, exhibited in the building by Mr. yne, and which is greatly superior to the ordinary kinds of Revitt that pear at market. This clearly shows that Revitt wheat of a certain kind d quality is better than Revitt wheat of a different kind, both being oduced in this country; so that, circumstances being equal, we have a ferent result, owing to some constitutional peculiarity of race. To other amples of the kind I cannot at present refer, because time will not permit e to dwell upon such points."

WARDIAN CASES.

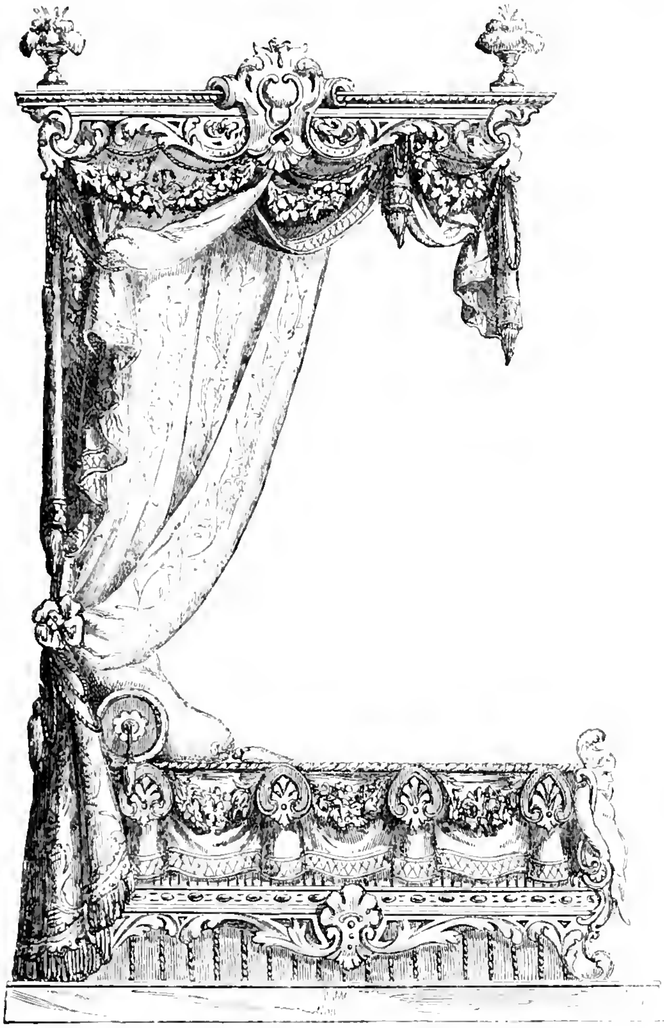
N various parts of the Great Exhibition Building were to be seen live plants, growing, in some instances, under handsome glass shades, and in her cases in glass frames, of so unprepossessing an appearance that one ght naturally be at a loss to account for the reason why so uninteresting object had been sent to the World's Fair. These contrivances are called ardian cases; it having been first discovered by Mr. Ward, that by them nts can be transported to and from distant regions of the globe, and also at by their aid the Londoner can succeed in growing a few flowers to eer his habitation. Some years ago we remember to have seen the vessel out to start to survey the settlement of Adelaide, in Australia, and we re much delighted to see two or three of these cases filled with small oseberry and currant trees, in order that the emigrants might enjoy those licious fruits which we have in such perfection in this country; and now t a week passes but ships arrive bringing plants from the remotest bitable regions in these Wardian cases, which have thus conferred upon a power of procuring exotic vegetable productions, which before their roduction was never possessed. These cases form, as it were, a little orld of themselves, in which those who cultivate plants may observe many culiarities. From being closed, the heat of the sun bestows upon them very high temperature at times, and the hygrometric state of the atmohere within varies according to circumstances, in a manner which may interest the cultivator of plants, and give him ample means to exercise his observation and talent.

In London but very few plants will thrive. The Oriental plane rears its head in the heart of the City, in Cheapside, and forms a stately tree. Russell square and Guildford-street exhibit, also, noble specimens of this beautiful tree; but coming into leaf late, and shedding its foliage early, it is not so susceptible of those influences which injure other plants. The lime tree will also partially flourish, and in the very centre of the Bank two noble and ancient limes shade the parlour from the scorching sun of summer, and yearly cast forth delicious perfume from abundant flowers. With these exceptions, flowers and vegetable structures can scarce be cultivated in London, except with the aid of a Ward's case. Residing in the very centre of the metropolis, we now write with two beautiful Ward's cases before us, which exhibit the most luxuriant foliage. In these cases we have at this moment the beautiful wax plant, or *Hoya carnosa*, in abundant flower. We have recently introduced the newly imported and lovely *Hoya bella*, which is also now in flower; and the odoriferous *Fracisca Hopeana* is always ready to refresh us by its scent on opening the door of the case. We have five species of *Lycopodia*, which gratify the eye by their luxuriant green; and no less than fifteen or sixteen species of exotic ferns gladden the eye by their charming forms, their verdant foliage, and luxuriant appearance. The leaves of the *Maranta bicolor*, never soiled by wet, are of surpassing beauty; and several species of *Achimenes* are rapidly growing to display their brilliant colours in the latter part of summer. Many of our plants have been in their present situation for ten years. In one of the cases exhibited was a specimen of the celebrated Irish fern growing in full health, and the lovely little Tunbridge Wells filmy fern also luxuriating. Our country friends will, doubtless, be much surprised when they are told that a small plant of the former fern, which grows wild in the British isles, fetches from ten to thirty shillings in London. The sale of ferns and native orchids has become a trade in London.

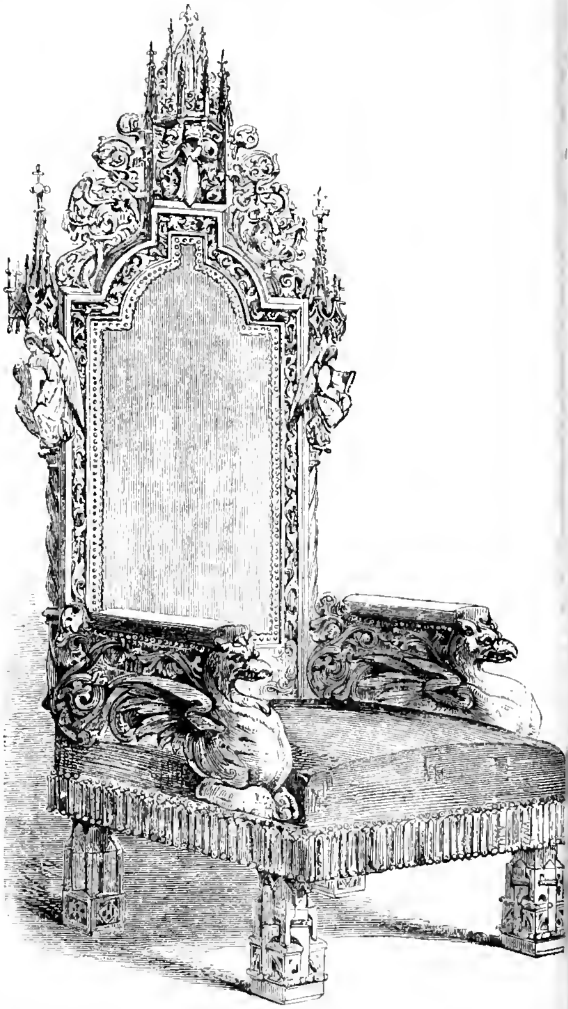
Mr. Marshall has lately constructed a Wardian aquatic case, wherein he grows many curious plants, and the miniature pond is overhung by ferns, which, doubtless, will thrive well in that situation. By simply preventing the access of the London smoke to injure the leaves, we have this year succeeded in growing cucumbers in the very centre of the metropolis, showing what may be effected when the deleterious gases which emanate from the combustion of coal are prevented from exercising their baneful influence.

SILVER VASE, BY ODIOT,

Of very elegant design, and chastely executed.



STATE BEDSTEAD.—FAUDEL AND PHILLIPS, NEWGATE-STREET.



GOTHIC CHAIR.—HOFFMEISTER, SAXE-COBURG.

STATE BEDSTEAD,

BY FAUDEL AND PHILLIPS, NEWGATE-STREET.

MESSRS. Faudel and Phillips exhibited a State Bedstead of needlework, produced principally from British materials, worked entirely by Englishwomen in London, including almost every description of ornamental needlework, the object of the exhibitors being to open a source of profitable employment, and to train a portion of our industrious female community. It is a gaudy affair, and by no means the sort of bed we should choose for a quiet nap. At the same time, its costliness and originality claim for it a somewhat detailed notice. On the footboard is a copy of Guido's "Aurora," in worked tent-stitch, with split wool. To produce many of the tints, split threads of various hues have been twisted together by the workers. This one piece contains upwards of 700 shades and 1,053,000 stitches. The tester, or head-piece, is worked in cross, Gobelin,

MEXICAN FIGURES.—MONTANARI.

and raised stitches wit wool, silk, twist, and ch nille. The centre is c pied from Thorwaldsen "Night." It is suspende from a wreath of flowe selected from and embl matical of all nations, tie together by laurel, iv and myrtle, emblematic peace. The fruits an breadstuffs of the worl united are raised wor and copied from Raffaelle ornaments in the Logg of the Vatican, but groupe to be appropriate to th present subject. Ther are here, in all, fifty-fou different flowers. The up per valences or hanging are entirely in silk ch nille, manufactured i Spitalfields. But it was great error in taste an judgment to attempt re presenting on a flat surfac the folds of velvet drap ries, supported by worke cords, &c. It is a decep tion which offends when is found out. The ceiling designed by M. Boiteu represents angels watch ing over the sleepers, an holding wreaths of rose over them; this, as als the inner cornices, are i

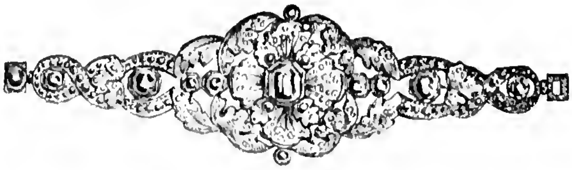
ross stich. The curtains are worked on white watered Irish poplin, the esign of the embroidery so arranged as not to show a join; they are 12 eet by 9 feet. The cover or counterpane is a junction, as it were, of all he parts; this, as also the curtains, have been designed by M. Boiteux, uperintendent of the work department of the exhibitors. The bedstead s carved wood, gilt in the Louis Quatorze style.

GOTHIC PANEL, BY THOMAS.

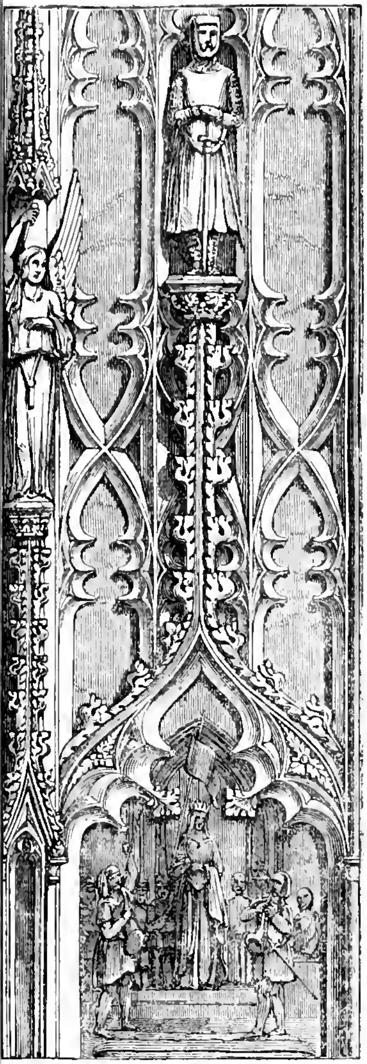
This Gothic panel is good in design and fairly executed.

CENTRE-PIECE, BY FROMENT-MEURICE.

This magnificent production is emblematic of the seasons bestowing their fruits upon the earth, which is supported by sea monsters. The work is admirably executed in the *répoussé* or punctured style.



BRACELET.—BOUILLETTE, HYOCLINE AND CO.



GOTHIC PANEL.—THOMAS.

CENTRE-PIECE.—FROMENT-MEURICE.

BRACELET, BY BOUILLETTE, HYOCLINE AND CO.

The bracelet by Bouillette and Co., is one of the numerous specimens f light imitative jewellery for which our French neighbours are so famous.

MEXICAN FIGURES, BY M. MONTANARI.

We have already spoken of M. Montanari's collection of Mexican figures, nd of Madame Montanari's wonderful dolls, of which latter we presented ur readers with a group. We now give a miniature representation of ome two or three dozen of the Mexican figures—productions copied with xtreme accuracy of form and colour after local originals, and therefore xtremely interesting as well as ornamental. We cannot help remarking, when contemplating these very accurate and amusing productions, and recollecting the equally remarkable models in the Indian department, that the power of imitation to an extent almost to be delusive is compatible with the total absence of all those higher principles which constitute the vitality of high art.

GOTHIC CHAIR.—HOFFMEISTER, SAXE-COBURG.

Upon this chair (the material of which is oak, covered with brown plush) a great deal of decorative fancy has been lavished; not, however, in our opinion, successfully. The incongruity of the devices must strike every beholder—griffins at our elbows, and ministering angels at our ears. The chair is certainly somewhat overdone, and has not a comfortable look. The carving, however, is very well executed.

FOREIGN AND COLONIAL DEPARTMENTS.

TURKEY.

THE contributions from Turkey were exhibited in a bay at the north-east angle of the transept, where by their gorgeous variety of bright colours and embroidery, they produced a very striking effect in the general *coup d'œil* on entering the building. Apart altogether from its intrinsic worth, is, moreover, the interest naturally attaching to the industry and productions of an empire the condition of which must always be regarded by the Englishman as of vital importance. Turkey justly looks to Great Britain as one of the foremost, the sincerest, and the most potent of her allies and friends; while Great Britain cannot feel indifferent to all that illustrates the internal condition of an empire that fills up so much of the vast space intervening between our Indian dominions and the central countries of Europe—an empire which includes within her territory the mouths of the Euphrates and the shores of the Persian Gulf on the one hand, and on the other divides with Austria the kingdom of Croatia.

In complete contrast to the wonderful extent and variety of the raw products of our colonies are those of Turkish industry; for in many of them we distinctly recognise a closer analogy to what the ancients have left behind us of their domestic manners than can be discovered even in modern Italy; for, while in the revival of the fifteenth, sixteenth, and seventeenth centuries completely modified Italian manners, much of the ancient forms found by the Moslems in the countries which they conquered have been left with little alteration. Of this no one can doubt who has looked at the collection in question, from the brass lamp with its scissors, pincers, and bodkin, to the arabesque plaster moulding and other slightly altered traditions of the world, of which the excavations of Pompeii have given us such interesting glimpses.

But it is not the conquerors of the Empire of the East that entwine themselves with our modern sympathies. Gibbon, with all his rhetorical splendour, illumines, but does not vivify the Amrus, the Saladins, and the Amuraths. Uhland, in one of his most exquisite sonnets ("Kaiser und Dichter"), contrasts the duration of the conquests of princes and bards; and all must agree with him, who have visited this collection, and think less of those who trod over great monarchies than of those who depicted the manners and superstitions of the Orientals. Not one in a hundred of those who visited these interesting collections, remembers that three centuries ago all Europe quaked with terror at the name of the Grand Turk, and that Solyman the Magnificent was an even more powerful Sovereign than Charles V.; but all remember, and none ever will forget, the heroes and heroines of the "Arabian Nights Entertainments." The Ottoman Empire is now an essential part of the "grand tour;" and, therefore, many who paced the Crystal Palace may have had comparatively little new to see in the Turkish department; but these few form, after all, an insignificant portion of the hundreds of thousands who have never seen either the Black Sea or the White Sea, the desert, or the palm grove; but are, nevertheless, familiar with the sayings and doings of the guarded city of Bagdad, from the street porter with his weary burthen, to the Caliph himself, attended by Jaifar the Barmecide and the redoubtable Mesroua-el-Siaf. It is, therefore, the latter portion of our fellow-countrymen that we invite to accompany us in a tour through the objects that appeared on the tables and in the stalls contributed by all parts of the Ottoman Empire.

Prominent in the centre of the tables stood a large machine of glittering brass and of elegant form, which looked like a huge tea-urn. This was a mangal or brazier, for charcoal, with which apartments are heated in winter. People in England may abuse our climate as they choose, but they may rest assured that in many respects it is not easy to find a better, for we are neither roasted in summer nor frozen in winter; and at Christmas time recommend us to the sun of Wall's End or Newcastle-upon-Tyne, which blazes in every snugly carpetted English parlour, to the charcoal of the most elegant mangal that ever was constructed. The mangal stands in the centre of the room, and a coverlet being thrown over it, the ladies of the hareem sit around it in a circle, and thus warm themselves in a manner not the most healthy or improving to the complexion. Beside the mangals are the basins and ewers, such as are used for washing before and after food—the servant holding the former in his left hand, while the water is poured out with his right. Here, too, were sherbet cups, the Bohemian practice of gilding stained glass having been originally borrowed from the East; and we need scarcely say that the European offspring excels by a long way the Oriental parent. But those shown at the Exhibition were creditable to the manufactory of Ingekyoi. It is climate that suggests the quality of diluents: and while the North is cunning in the distillation of strong liquors, the South is equally remarkable for the ingenuity with which cooling drinks are compounded, from the choice lemonade and orgeat to the delicious chopped ice sherbet with the orange-flower flavour. Let it not be supposed that it is only in idleness and in the arts of pleasing that the ladies of the East pass their time: here, to be sure, were ingenious cosmetic boxes, with various compartments for the different dyes used in adornment: they are equally skilled in the useful and domestic arts, and the ladies of the highest rank are acquainted with the art of preparing such drinks. In that of pre paring fruits they even excel our own housewives, and a very large mother o'pearl frame for embroidery reminds us that the most beautiful dresses of the wealthiest classes are the product not of the professed milliner, bu of the domestic hareem.

The military character of the Turks was sufficiently recognisable in th collection, many objects showing them to be essentially a nation that mount much on horseback, lives much under tents, and has adapted its habits t military locomotion. Every one who has lived in a Turkish camp, or ha seen how easily Turkish troops are moved, is impressed with the adaptatio of their habits to this phase of life. It would take too much space t enumerate the articles illustrative of this part of our subject: their cam dishes fitting into each other and easily portable, their lanterns that shut u and open out like magic, and many other articles, show that with th Orientals there is not, as with the European, that broad line of distinctio between the habits of residence and the habits of locomotion that exists i the West. It is not merely the aboriginal and nomade habits that accoun for this; there is a political reason: the constant fear of the great dignitarie of the empire acquiring a formidable local influence, causes a perpetua circle of recalls and nominations in order to maintain in efficiency th functions of the central Government: this produces a great deal of move ment from one end of the empire to the other on the part of thos dignitaries, military and civil, who in the Ottoman Empire stand in th place of a hereditary aristocracy. Thus, whatever is portable, whethe diamonds, carpets, or shawls, is prized; hence, too, the expensive velvet and gold embroidery bestowed on their saddles. And instead of such pon derous fixtures as the European writing desk, the pianoforte, and the orga there is the diminutive cocoa-nut, or brass inkstand and pens for the hour of business, or for the hours of diversion there is the light reed *nay* or flut the lute, or the violin, of the most primitive construction, such as one see in the productions of the very early Italian painters.

But we are getting into a tangled web of philosophy, instead of proceedin with our catalogue *raisonné* of the different objects. An examination of th collection of beads repaid trouble—the habit of passing beads through th fingers being as inveterate with many Turks as the perpetual wood-whitlin of a Kentucky man; we have even known an individual who weaned himsel from this practice, and yet never met another person with beads without bein unable to resist the old temptation, and beg for them to pass through hi fingers.

Fezes from Tunis and Egypt there were in abundance, and also plenty c stuffs for wrapping round them hanging in various parts of the collectio from simple cotton to fine shawl; but we saw no regularly wound and mad up turban, such as is worn in the East, but a not uninteresting substitut in one of stone or plaster, such as usually adorn the cemetries of the Turk

The water-pipes are uncommonly beautiful; we mean those in whic Bagdad timback is smoked through snaked-formed tubes, and which fro the noise produced by the passage of the air through the water is common called the bubble-bubble. In those vases and in the snakes are foun a skilful attention to effects of colour; and if we pass to other objects, suc as dresses, shawls, scarfs, girdles, we may remark that the suitableness c very bright and contrasted colours to these warmer climates, springs fro the semi-obscurity of apartments partially darkened to exclude the heat an light of the sun. It was the Venetians that most fully understood thi phase of the beautiful. Hence, in consequence of the limpid depth of hi shadows, the boldest colours of Paul Veronese never shock us, which i certainly more than can be said of Rubens, with all his genius and facility and this peculiar quality of the Venetian school could never be attained b northern painters living in climates where every effort is made to get a much of the sun as possible, nor by any set of men whose eyes are no educated to the effect of brilliant colours in every variety of sombre shadow From tracing the connexion of Venice with the manufactures of the Levant so frequently introduced into the Venetian pictures; the observation of th relation of the Levant to the arts of Italy cannot be considered as a *baroqu* transition, and those who take an interest in the old pottery of Faenza ma remark the prevalence of that Faenza-like green and yellow in the rud pottery of Tunis.

Such observations are made for the many who paid their shilling, an not for the season-ticket holders, who have lounged up and down the Levant and may have made such remarks for themselves; but even to the *homm blasé*, in relation to Oriental life, there was much to fix attention. A jar o dates is a jar of dates, but certainly a common jar of Barbary dates has no the same interest for us as one from Medina, grown under the aëronautica sarcophagus of the prophet himself. One jar of curdled milk is like another but when we know that the one before us is that of an African ostrich, i ceases to be common milk.

"Would you like to give a guinea for one of those spoons?" said a friend who conducted us through this portion of the Exhibition.

"We should be very sorry."

"Well, there is one that you cannot have for less than 30*l.* sterling."

We saw that it was not of tortoise-shell nor of ivory, but something o excessively fine texture, between the two, and learned that it was a beak of the spoon-bill heron, a bird now so rare that it promises to become at n distant date as extinct as the *Megatherium* or the *Ichthyosaurus*. Even the specimens of ingenuity degenerating into the *baroque* were not without interest; here was a wooden chain, each link perfect without a joining, and cut out of one piece of wood, a piece of laborious handicraft. On seeing a shirt almost stiff with gold lace, we were reminded of the quaint pages of

outhey's "Doctor," who on reading of some man who had a shirt of gold nd a shirt of silver-thread, declared his preference for the perhaps unkingly ut more comfortable nether garment of Flanders linen. And much as we ave praised the Turkish aptitude for the portable, it was scarcely without smile that we passed the odd combination of a chibouque and the crutch f an invalid.

But it was not merely the gratification of a fastidious curiosity that endered a visit to the Turkish collection attractive; it was in fact the best nd most interesting lesson in physical and commercial geography, in relation o so large a part of the world, that has hitherto been offered in this metropolis. 'urkey has neither the scattered colonies, such as the British empire, nor as she the vast extent of territory possessed by Russia; but no state in the vorld is, to use a German phrase, so many-sided, or presents such contrasts f productions and manners in consequence of the diversities of her nations nd climates; and her vast contiguous territory is rather ruled by Turks han quickly settled by them, for they are rather the conquerors than the olonists of the wide territories stretching from the Caucasus to Algeria, rom the Adriatic to the Persian Gulf. Most travellers dilate very largely n the vices and corruptions of the Turkish administration of the various epartments of government; but it cannot be denied, that, although the arch of government is less regular than in Europe, the State itself is ithout the burthen of a national debt; that the internal taxation, although omewhat arbitrary in application, is, upon the whole, very light. The rincipal cause of this is the very large revenue which she derives from a ale of customs duties fixed upon solely with a view to revenue, and not dapted to produce an artificial scarcity favourable to the few who have to ll a particular commodity, and injurious to the general interests.

We usually associate the Ottoman dominions with heat rather than with old; but there was exhibited an elegant sledge from Jassy, the capital of Ioldavia, which showed not only the love of luxury in the boyars of that rincipality, but reminded us that Russian vicinity has imprinted Russian anners on a part of the Ottoman empire, which, from its level plains and vere winter, in no way belongs to the East as sung by the Byrons, Goethes, nd Moores, and which, if it has neither the azure skies of summer climes, as, throughout the length and breadth of its territory, the thick rich luvial soil which makes the plains of the north of the Black Sea a granary f all Europe, and procures for the boyars of those principalities incomes r exceeding those of the average of the impoverished *noblesse* of the ontinent of Europe. We therefore see that the manufactures of those arts spring from their economical circumstances; they have neither silks or velvets, but their wax-lights and other modifications of native productions urprise by their cheapness.

If we cross the Danube into Turkey in Europe we find in this Exposition omparatively little to remind us that Ternovo, a city of Bulgaria, was, at he end of last century, one of the most active manufacturing towns in Europe. But we find in Turkey much the same phenomenon as in India—he immensity of British capital and machinery has swallowed up the maller industries, as the large fishes eat the small, and the two thousand ooms of Ternovo have fallen down to a mere remnant. The Turkish Exposition was, therefore, less remarkable for its manufactures than for hose articles in which we see patient and ingenious handicraft exercised pon manufactures, such as the embroidery of female articles of dress, among hich we may specify gold upon a light blue ground, silk of various colours orked upon white muslin, and the winter dresses, remarkable for their legance, the best combination of which is black silk upon a chocolate round.

In Albania, that land of mountain warfare, it were vain to expect the esults of either capital or machinery. The turbulent character of the opulation is brought to our observation by the excessive elaborateness of heir rifles and pistols, which are as much an object with a wealthy Albanian s a horse to an Arab, or a carriage and a box at the French theatre to the oyar of the principalities.

In the vast plains of Roumelia, we observe signs of a climate more genial han that of the principalities, and of a population less turbulent than that f Albania. The sight of the cotton and tobacco of Macedonia was pleasantly elieved by the fragrant odour of otto of roses from Kasanlik. The heavy rticles of export were not so much from the capital itself as from Salonika, myrna, and other ports. The capital is the receptacle of a large mass of ritish, French, and Austrian manufactures, annually exported to Turkey, ut it is at these other ports that vessels seek their return cargoes.

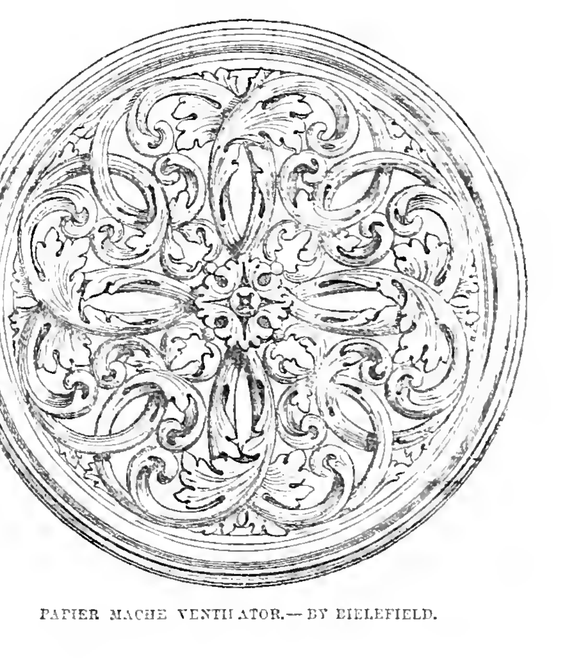
As a place of manufacture, Constantinople itself is a sort of Paris to the astern world, and productive rather of the diversified objects of luxuriant onvenience adapted to Eastern usages than of articles of first necessity, hich recommend themselves by cheapness and general use. For instance, he cymbals of our military band were originally introduced from the East, hich is shown by the habit of the cymbal players in various European rmies still wearing an Oriental costume; and we were amused on seeing n English inscription, rudely engraved on a pair, which runs as follows:—"This sort of zich was invented by Mr. Kevork, A.D. 1730; and the present as been manufactured by his grandson's grandson, Mr. Kirkov, A.D. 1851, samatia, Constantinople."

After contemplating the very neat model of a Bosphorus kaik, and having rossed this marvellous and beautiful river of salt-water, flowing between its mbrageous banks to the Sea of Marmora, we occupied ourselves with the siatic portion of the Ottoman contributions, which is still more highly avoured by climate, richer in classical associations, not less remarkable for atural capabilities, having mineral and agricultural wealth—much of it, alas, too dormant considering its advantages! being bordered with most excellent ports from Trebizond and Samsoun round to Marmorice, and other ports on her southern coast, which everywhere present themselves to facilitate communication. Here was the copper of the mines of Tokat; here was the excellent sword cutlery of Adana; here was the wealth of the waters of the Archipelago, the sponge torn up from the depths of the Mediterranean by the boldness and ingenuity of the diver, with the still adhering oyster; here was the large black wheat of Konieh, the ancient capital of Turkish power, long before the sons of Orchan became the terror of Europe; and here, too, were those large and excellent Turkey carpets, which stand their ground so successfully against the skill and capital of our own Kidderminster.

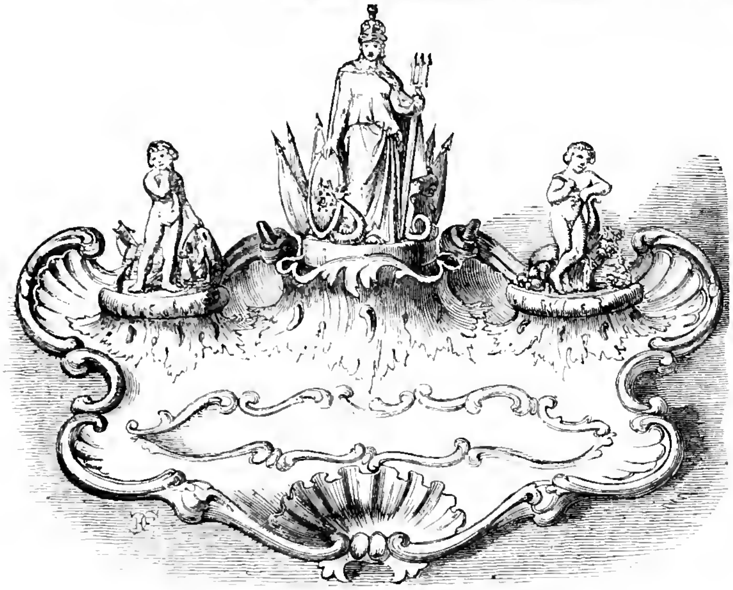
We now make haste to cross the Taurus, and get into Syria, which has much to interest both in the way of natural productions and manufactures. The tobacco of Latakia is still beyond all comparison the best either of the New or the Old World: for no American tobacco is in delicacy of flavour equal to that grown in the mountains between Tripoli and this place. The silks of Mount Lebanon and of Broussa, in Asia Minor, were also put together, and were well worthy of an examination. The silk of Syria has been until lately unsuited for exportation to England, in consequence of its being long reel; but, latterly, by the exertions of M. Portalis, a French merchant in Beyrout, and of the active and ingenious Messrs. Barker, of Aleppo, sons of our late well-known Consul-General in Egypt, manufactories, with improved machinery, have been established by the former firm in Mount Lebanon, and by the latter gentleman at Suediah, near the mouths of the Orontes, with such results as to leave no doubt of the advantages likely to accrue from an extension of British capital in this direction.

If we pass from the coast to the interior, the great cities of Damascus and Aleppo arrest our attention by their manufactures of mixed silk, cotton, and gold thread, which are equally remarkable for their richness, their elegance, and their substantial strength, being universally used for the holiday dresses of the inhabitants of those countries; the ingenuity and machinery of France and England having produced no successful imitation, these native manufactures, along with those of silk sashes for turbans and girdles at Tripoli (Syria), still continue to vegetate, although certainly in a decayed condition. In Aleppo this manufacture is mostly in the hands of the Christians, the shameful plunder and outrage of whom last year by the fanatical Moslems, being a blow from which it will be long before they recover. Of other manufactures, the saddle from Damascus is characteristic of the country, but does not give a favourable idea of the ingenuity of the Damascenes. What a European most prizes is their excellent preserved fruit, the whole territory that surrounds the town being one vast orchard, intersected by the seven-armed Barrada; while the principal art and handicraft of the place—which is that of mosaic pavements, the beauty of which strikes all strangers—is not of a nature offering capability of being shown in an Exhibition such as we describe.

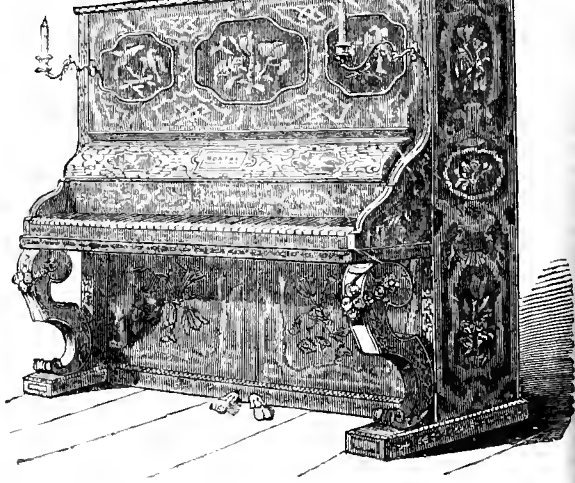
As for Arabia—that waterless land of stones, sand, camels, and starved shrubs—so lacking in corn, wine, and oil—so contrasting to Egypt with her flesh-pots, and fertile rather in rhymes and metaphysics than in the good things of this world—it certainly has very little to show; but, as a natural production, the coffee of Mocha is not to be despised, and what human work of art has ever even approached the sublime elevation of the rhythm of the Koran?



PAPIER MACHE VENTILATOR.—BY BIELEFIELD.

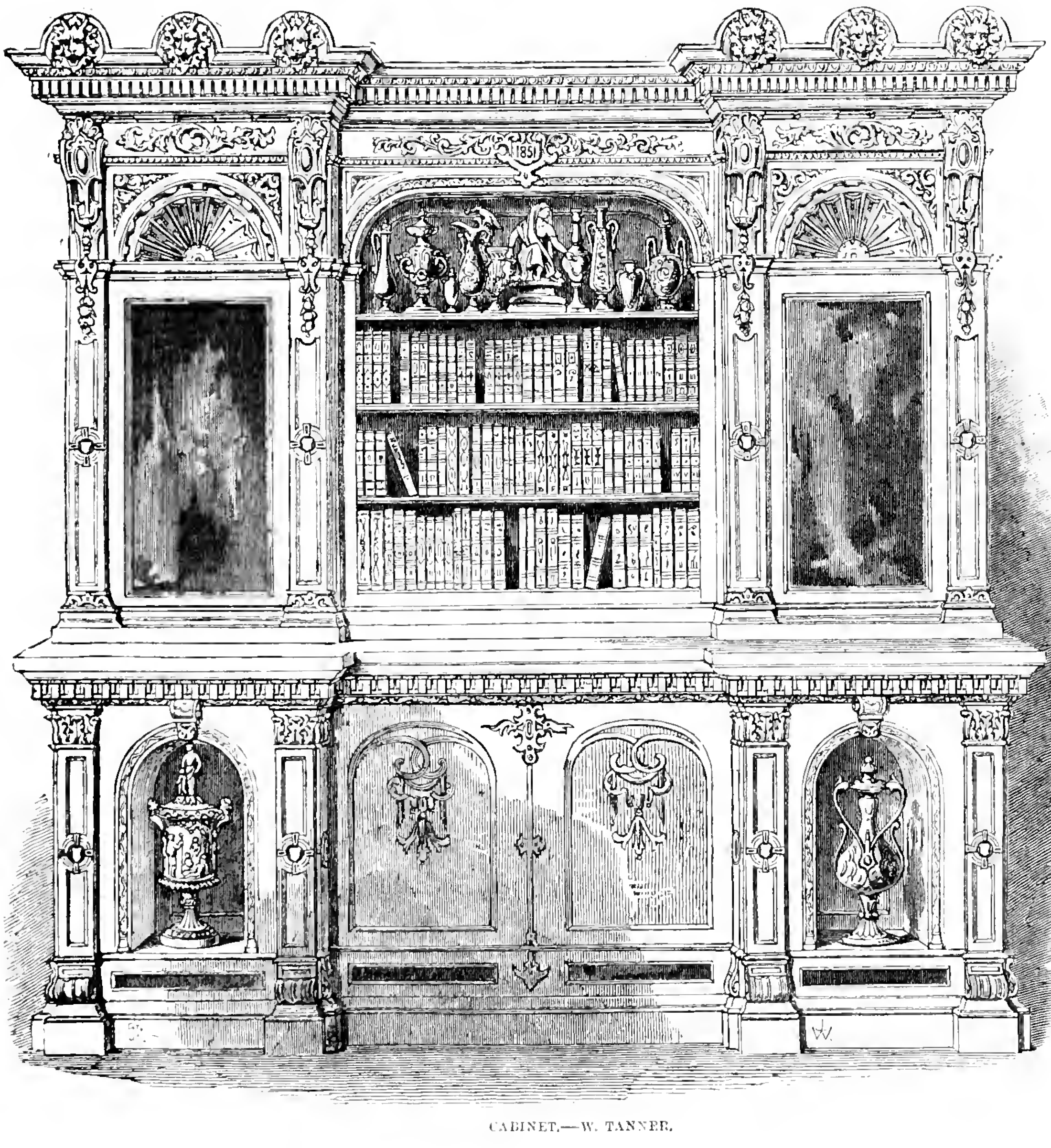


SILVER INKSTAND.—LAMBERT AND RAWLINGS.



MINIATURE PIANO FORTE.—MONTAL.

We engrave a little cabinet piano-forte by Montal, as a model of exquisite taste in ornamental furniture. It is richly embellished in enamel painting, buhl, &c.



CABINET.—W. TANNER.

SILVER INKSTAND.

LAMBERT & RAWLINGS.

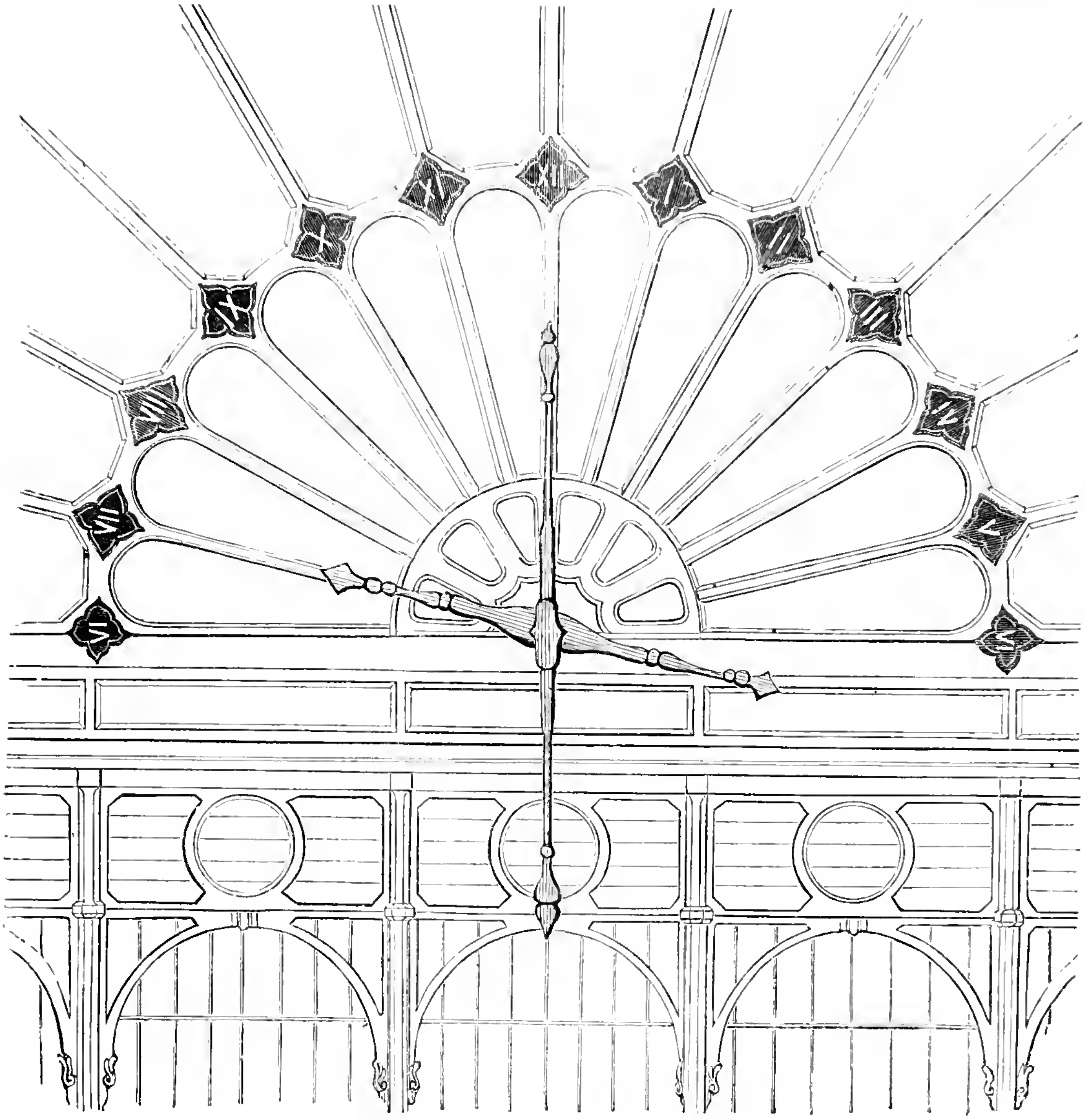
This is a very showy affair, almost too showy for our taste. In the centre we have a figure of Britannia; and, on either side, smaller ones of Commerce and Plenty, executed in frosted silver, and which, we presume, are intended as handles to the covers of the ink and wafer bottles. The tray in front, which is a shell pattern, is richly gilt.

CABINET.

BY W. TANNER.

The design of this Cabinet is very chaste and elegant, and is the more creditable as being entirely the work of an operative cabinet-maker of Bath. The style of this piece of furniture is of the period of Francis I., the material Riga and pollard oak. The effect, in our opinion, would have been better if the latter had been omitted, and the wood all of one colour; as for the ebony slab, it is decidedly too heavy to harmonise with the rest of the work. These are, however, errors of judgment, which may easily be avoided in future. The finish of all the parts, the ornamentation of which is rich without heaviness or redundancy, exhibits admirable workmanship.

The
CRYSTAL PALACE
AND ITS CONTENTS.
AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.



THE HANDS AND FACE OF THE ELECTRIC CLOCK.

SHEPHERD'S ELECTRIC CLOCK

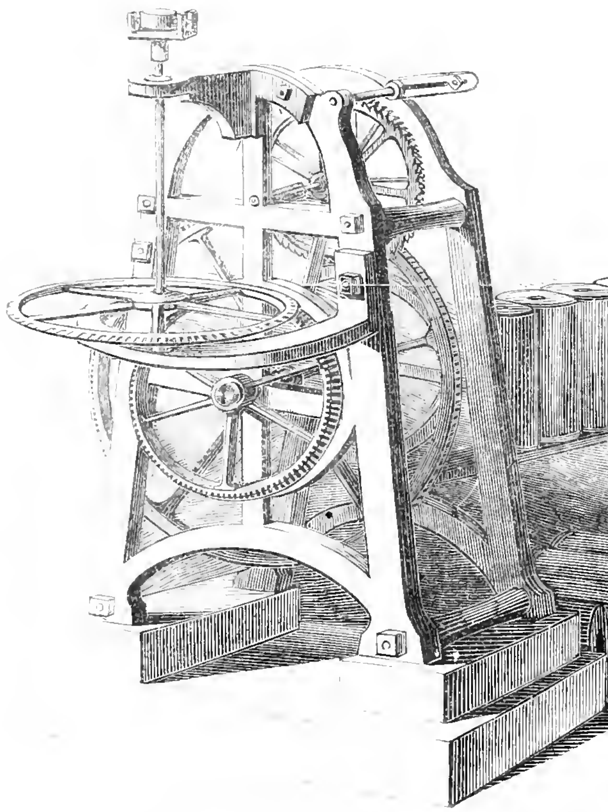
AT THE GREAT EXHIBITION BUILDING.

EVERY one who approached the Great Exhibition Building from the South, remarked, and not a few were puzzled by, the appearance of the clock which surmounted the principal entrance on that side. Some account of this clock will be equally interesting as a specimen of workmanship in the department of Horology, and as an application of the electric fluid as a motive power. But first, it will be proper to speak of the external appearance of this ingenious piece of workmanship as affixed to the Crystal Palace.

In adapting Mr. Shepherd's beautiful Electrical Clock to the external design of the building in Hyde Park, Mr. Owen Jones, to whom all matters of ornament connected with the building were left, ingeniously contrived a plan by which the conventional form of a circle for the face of the clock was dispensed with, in order that the elevation of the south end of the transept might not be disfigured. In our Illustration, showing the arrangement of the hands and figures, it will be seen that the clock-face in the present instance is a semicircle, having, as usual, twelve divisions, and that the figure 12 is, also as usual, at the top of the circle. The numbers corres-

ponding with one clock, &c., likewise follow in the usual order; but, as with one hand only the semi-circular dial would be left without the hour-hand for intervals of each alternate twelve hours, a second number 6 has been added on the west side of the dial, and also a second hour-hand, which points to the number 6 on the west side, as the first hour hand leaves the number 6 on the east side. The hour-circle is 24 feet in diameter. The hands are of copper, gilt. The minute-hand is 16 feet long, purposely shortened so as not to descend below the fanlight frame. The 13 figure-plates, which are of zinc, are secured to, and correspond in shape with, the intersectional spaces formed by the second semi-circular bar from the centre, and the radial bars of the great southern fanlight of the transept. The figures are painted white on a blue ground, in order to harmonise with the two prevailing colours of the external decoration of the building. The whole has a very unique and pleasing appearance.

Electrical Clocks are by no means new. We remember to have seen more than one in action, many years since, at Mr. Dent's, in the Strand; and Bain's Electrical Clocks were fixed in different parts of the house numbered 345, in the Strand, when occupied by the Electric Telegraph Company, and one on his plan at the office of the same company in Lothbury. There was also one fixed in front of the Polytechnic Institution, in Regent-street; and several have since been fixed at various private houses. Each



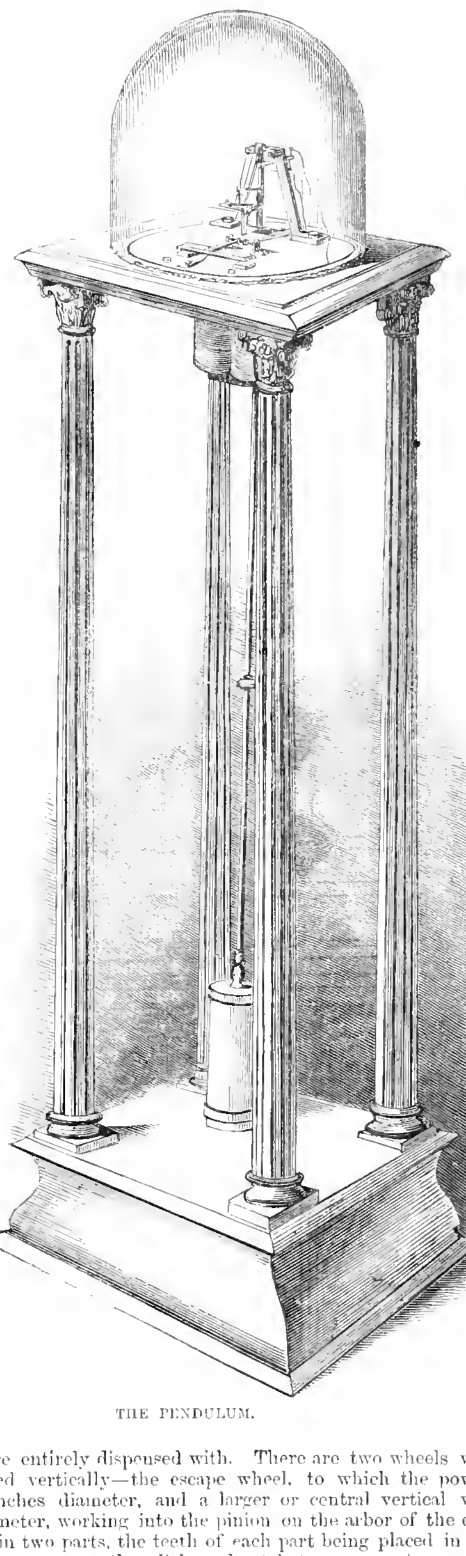
MECHANICAL VIEW OF THE ELECTRIC CLOCK.

of these last mentioned was worked in connexion with an earth-battery, which was found, in some cases to afford, if not an uncertain, at any rate, an insufficient amount of power.

The effect of Mr. Shepherd's improvements in the application of electricity to horological purposes has been to attain a greater uniformity and certainty in the *going* of his clocks; and, at his establishment in Leadenhall-street, he has had one of his Electrical Clocks in connexion with a Smee's battery, at work for the last two years. At Mr. Wood's, Hampstead, and at other private houses, they have been found to keep excellent time. At Mr. Pawson's, St. Paul's Churchyard, eight of such clocks have been successfully used. The leading features in Mr. Shepherd's Clock are the application of the wonderful agent electricity to the winding up of the impulse spring or weight; in order to render the *escapement*, or impulse given, certain in its action; and to improvements in affecting the movement of the train in order to denote the hours, minutes, and other subdivisions of time.

In the Great Exhibition Clock, certain alterations in the details of the magnetic apparatus have been rendered necessary in order to suit the particular case; and here we may notice, that, besides the great Electrical Clock for the transept, which we shall attempt to describe, two dials of smaller size, one at the east and the other at the west end of the Building, were also set to work in connexion with it. The electric current to each of the two auxiliary clocks was transmitted through copper wires coated with gutta-percha.

The mechanism of the clock, a view of which was given, was fixed in the south gallery of the transept, at about 48 feet below the centre of the dial, and motion communicated to the hands by means of a rod made up of several lengths of brass tubing screwed together, and of $1\frac{1}{2}$ inch in diameter. The clock-frame is much lighter than usual, as the ordinary



THE PENDULUM.

heavy weights are entirely dispensed with. There are two wheels within the frame, placed vertically—the escape wheel, to which the power is applied, of 10 inches diameter, and a larger or central vertical wheel, of 18 inches diameter, working into the pinion on the arbor of the escape wheel, which is in two parts, the teeth of each part being placed in opposite directions; on one part the click and ratchet escapement acts being moved by the electro-magnets, while the teeth of the other part are employed to lock the train and prevent it running forward from the action of the wind on the hands. The large wheel revolves once in two

hours, the spindle of which projects beyond the frame, and carries a bevelled wheel of 12 inches diameter, placed vertically, which revolves with it. In order to give motion to the vertical rod already described, the bevelled vertical wheel works into a second bevelled wheel placed horizontally; and above the first, on the axis of the horizontal bevelled wheel, the vertical rod or shaft revolves; and by means of wheel work at the top of the shaft, the hands of the clock are also made to revolve.

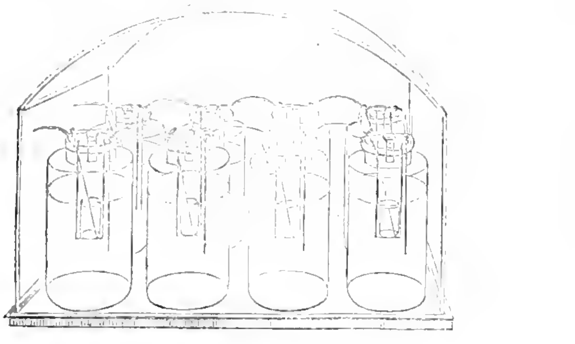
The whole is kept in motion by a series of powerful electro-magnets, eight in number, on which is wound a total length of 25,000 feet of copper wire, of the size usually denominated "No. 18, Birmingham wire-gauge," the weight of the wire being nearly one and a half cwt.. Six small batteries of Smee's construction were used in connexion with the electro-magnets. Mr. Shepherd prefers Smee's battery to any other, on account of its simplicity and the ease with which it is charged when required.

Besides the 24-feet dial on the south side of the Transept, two smaller dials, already alluded to, each of five feet diameter, were fixed in front of the galleries, at the east and west end of the building respectively, in the centre line of the nave. All the dials were governed by one pendulum. [See the third Illustration.] The pendulum was kept in motion by electro-magnetism, on a plan entirely differing from any method previously invented. The magnet in these clocks is employed merely to bend the spring at each vibration to a certain fixed extent, the reaction of the springs giving the necessary impulse to the pendulum, by which means the variations which are continually taking place in the batteries have no effect on the time measured by the pendulum. At the end of each vibration of the pendulum it comes in contact with a small spring tipped with platinum, which completes the necessary circuit for giving motion to the several clocks. One of the great advantages of Shepherd's clock is that the largest hands may be moved with all the accuracy of those of an astronomical clock. The impulse-spring is screwed on to a brass stud fixed on the bed plate, through a slot in which the pendulum vibrates. It has a small arm extending nearly at right angles, and a second arm which projects from the armature, which being attracted down by the action of the magnet, the poles of which pass through the bed-plate, the other end of the armature comes in contact with the arm projecting from the impulse-spring, and raises it so as to lock the upper end of a detent, which is screwed on to the same stud as the impulse-spring.

The pendulum, in the course of its vibration, comes in contact with the upper part of the detent, which it lifts up, thereby leaving the impulse-spring free to drop on the side of the pendulum, and follow it for a short space of its vibration, so as to give it the necessary impetus, forming what is technically called among clock-makers the *remontoir* escapement, and which, in the present instance, is in its most perfect form.

THE EXHIBITION VOLTAIC BATTERY.

In connexion with the above, we propose to give a short notice of the novel form of voltaic battery which was employed as a source of power, for the propulsion of the works of Mr. Shepherd's clock. This form was devised by Mr. Alfred Smee for this clock, and contains numerous adaptations of scientific principles. The negative plate consists of a strip of



THE EXHIBITION VOLTAIC BATTERY.

platinised silver, the platinum being used in the finely-divided state, in which Mr. Smee first discovered that most metals had the singular power of facilitating the evolution of the hydrogen; and the visitor might have observed a constant stream of infinitely fine bubbles of gas continually rising to the surface of the fluid. The positive pole consists of pieces of the thinnest rolled zinc immersed in mercury. The reason for using this zinc is, that, in the process of manufacture the purest zinc is used for that purpose, whilst the baser portion is used for the thicker plates. The use of the mercury is to prevent local action by the adhesion of the hydrogen to its smooth surface. It is of very great consequence to place the porous pot in the right place. If it were placed at the bottom of the solution, during the action of the battery it would become encrusted with crystals of sulphate of zinc, which would effectually prevent any further action. By suspending it, however, at the upper part of the solution, the salt falls eventually to the lower part of the solution, and becomes uniformly diffused through the whole fluid. A platinum wire, coated with gutta percha except at its end, passes into the mercury, and is connected to a binding screw to form connexion. The battery is charged with dilute sulphuric acid, in the proportion of one to [illegible], and the size of the [illegible] must depend upon the time which the battery [illegible] required [illegible] action, and the amount of the work which it [illegible]. In obtaining force for an arrangement of this character, nothing can exceed the economy of material, for almost every particle of metal [illegible] contributes its effective power, and thus the cost [illegible] depends upon the value of the zinc. There can be no question that there is nothing to be compared to this form of battery for clock purposes, and probably it will be found the best battery for telegraphic communications. Whether it can be as successfully employed for electro-metallurgic operations and other cases of heavy work as the ordinary form of Smee's battery, we are unable to tell, but recommend its trial to those who are interested in this matter. The great clock, notwithstanding the large surface exposed to the wind, and the high gales to which it was exposed, continued to mark the time in a satisfactory manner.

TAPESTRY PATTERN.—BY W. CROSSLEY, HALIFAX.

Messrs. Crossley, of Halifax, exhibited some very beautiful tapestry-work, one of which we engrave. The design and colouring are alike lively and agreeable; and the texture of the surface is of the richest quality, bidding fair for successful rivalry with the productions of Gobelins and Aubusson.

FOREIGN AND COLONIAL DEPARTMENTS.

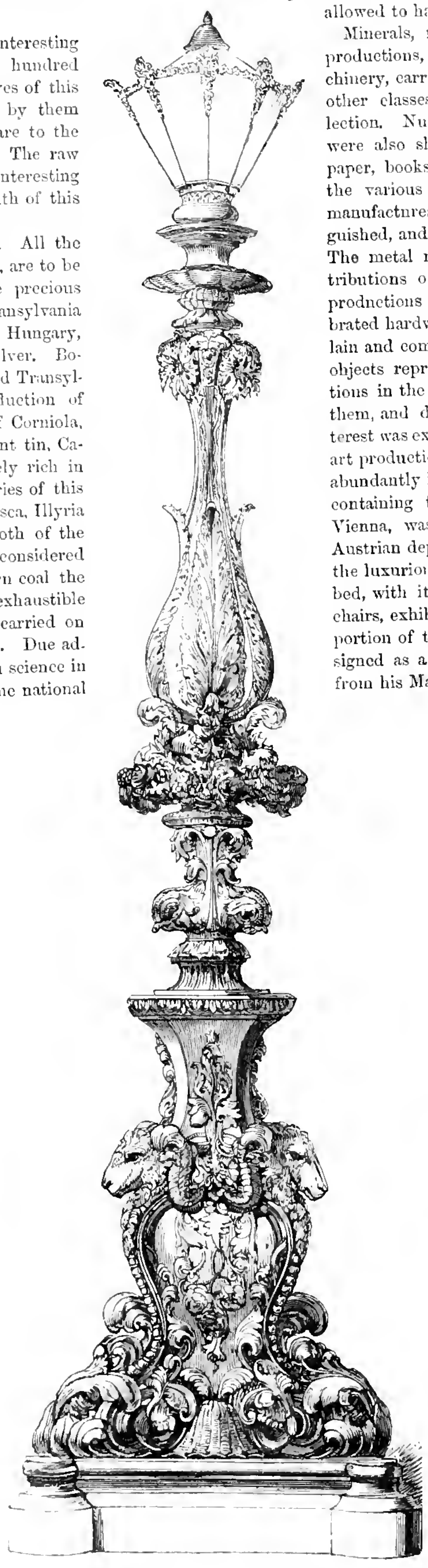
AUSTRIA.

THE Austrian productions formed a highly interesting feature in the Great Exhibition. About seven hundred and fifty exhibitors appeared as the representatives of this important territory; and the articles forwarded by them must be acknowledged to have added a large share to the attractions of the Foreign side of the Building. The raw materials were largely represented, and by a most interesting selection of objects illustrative of the mineral wealth of this monarchy.

"Austria abounds in every description of metal. All the more useful kinds, with the exception of platinum, are to be found therein; and in the productions of the precious metals, Austria is surpassed by Russia alone. Transylvania is one of the richest countries of Europe in gold; Hungary, also rich in gold, is still richer in its yield of silver. Bohemia ranks next to Hungary in this respect, and Transylvania immediately after Bohemia. In the production of quicksilver, Austria, by reason of her possession of Corniola, stands next to Spain. Bohemia supplies excellent tin, Carinthia the purest lead, and Hungary is extremely rich in copper. Iron is produced throughout the countries of this empire, the only exceptions being Görz and Gradisca, Illyria and Venice. Styria is pre-eminent in respect both of the quantity and the quality of its iron, which is considered equal to any raised in Europe. Fossil and brown coal the Austrian dominions may be said to possess in inexhaustible abundance, and, in consequence, mining has been carried on in these regions with peculiar spirit and energy. Due advantage has been taken of the progress of modern science in so pushing the advancement of this branch of the national industry, that though it cannot be said to have attained the utmost degree of development which it may be capable of reaching, yet it must be allowed to have closely approximated to it."

Minerals, metals and their ores, chemicals, agricultural productions, silk, raw and manufactured, models of machinery, carriages, and a variety of objects illustrative of the other classes of the Exhibition, were found in this collection. Numerous philosophical and musical instruments were also shown. The textile manufactures, and leather, paper, books, and printing were adequately illustrated in the various articles belonging to their classes. In glass manufactures Austria has long been pre-eminently distinguished, and the specimens exhibited sustain her celebrity. The metal manufactures were also illustrated by the contributions of a considerable number of exhibitors, whose productions bear comparison with the universally celebrated hardwares of England. Beautiful examples of porcelain and common wares were exhibited. The miscellaneous objects represented in an interesting manner those variations in the products of foreign artizans which characterise them, and distinguish them from our own. Universal interest was excited by the fine specimens of statuary and other art productions exhibited by Austria, which we have already abundantly illustrated and described. The suite of rooms containing the articles made by the Messrs. Leistler, of Vienna, was one of the most interesting features in the Austrian department, and presented an imposing picture of the luxurious furniture of the nobility of Austria. The state bed, with its appendages, the dining-tables, side-board, and chairs, exhibited a lavish outlay of ornamental labour. One portion of this furniture, a carved Gothic bookcase, was designed as a present to her Majesty the Queen of England from his Majesty the Emperor of Austria.

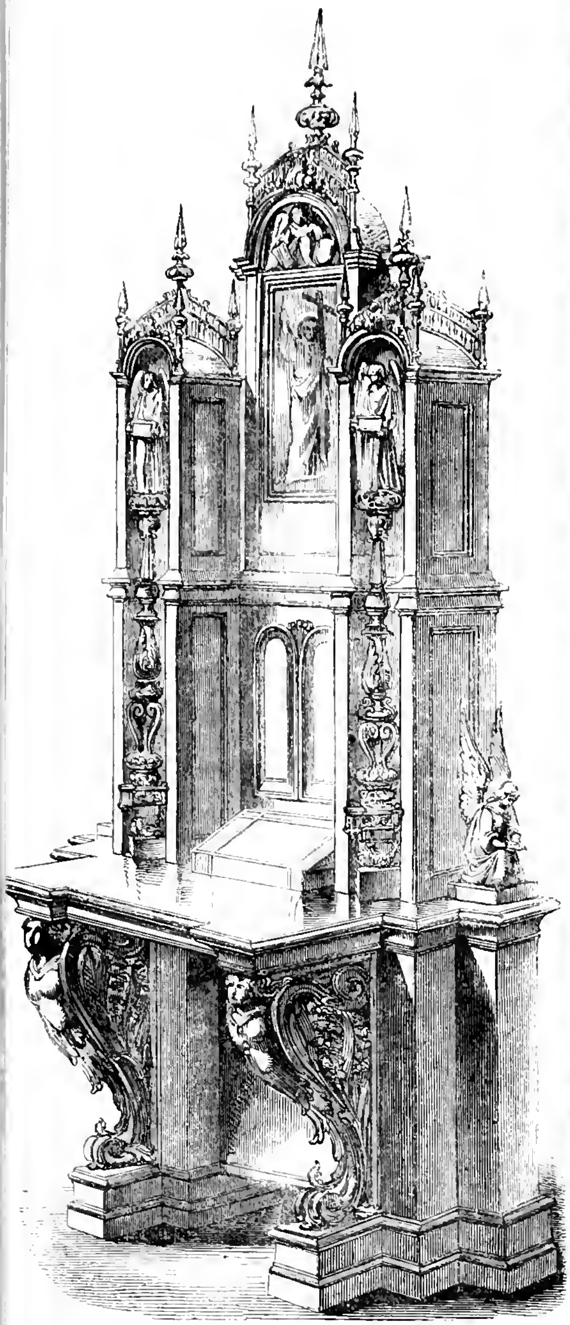

STATUETTE.—BLENKHORN.


CANDELABRUM, FROM AUSTRIA.


STATUETTE—BLENKHORN.

CANDELABRUM. AUSTRIAN DEPARTMENT.

THE design, by B. de Bernardis, a German architect, is good as an instance of how the Italian styles are understood in Austria. It is very elegant, and the massiveness is placed where it should be—in the base. It was produced at the foundry of the Prince of Salons, at Vienna; and it must be remarked, despite what has been said of German casting, that this work is not superior to that of the Coalbrookdale Company, of which several examples of large dimensions, and in various styles, were in the Exhibition.



PRIE DIEU.—LEISTLER.

TRANSPARENT BLIND.—BACH.

THE Prie Dieu, by Leistler, is Gothic in structure, and very richly carved. In the central panel is a painting of Christ bearing the cross; on either side are angels holding tablets, on which are inscribed the date, "Anno 1851."

STATUETTES. BY BLENKHORN.

THESE Statuettes were rather rudely cast in zinc, and represented personages in the poetry of Germany.

THIS is one of the very handsome productions, to be used both as curtains for windows, and the door of apartments, exhibited by M. Bach, of Paris.

RAILWAY DEPARTMENT.

RAILWAY PLANT.

(*Continued from page 353.*)

HAVING in the previous article gone through the "rolling" plant, we will now proceed to the "permanent way" and stationary furniture of a railway, including the rails, chairs, sleepers, turn-tables, traversers, and signals, &c., in connexion therewith.

Before the introduction of rails, the use of tram-plates of iron was very general in the coal districts of the north of England. These trams were formed with a side flange, to prevent the cylindrical form of wheel from running off the way. As soon, however, as passenger traffic was introduced, the edge rail came into use on the Stockton and Darlington and the Liverpool and Manchester railways respectively, and on some of the coal lines. So much had to be learned with regard to this back-bone of the permanent way, that rails weighing only 35 lb. to the yard lineal were, in the first instance, laid down on the "great experimental line" between Liverpool and Manchester: which were, however, soon found to be unfit for the heavy loads continually rolling over them. The Leeds and Selby, and other railway companies about that time, adopted the same weight and form of rail. At the present time the rails have reached to upwards of 80 lb. to the yard lineal; but it has arrived at this large section only by gradual steps.

In Wishaw's "Railways of Great Britain and Ireland," published in 1840, we find engraved sections of *eighty-four* different forms of rail, including those on the Transatlantic lines, and also on various European railways. Of this number, 19 were modifications of the bridge form originally adopted by Mr. Brunel for the Great Western Railway, which was in every respect a new model, differing entirely from all its predecessors, including the "gauge of way," which caused so much discussion among engineers, and led to the battle of the gauges. Mr. Brunel's first bridge-rails were also too light, being only 45 lb. to the yard; and, as was the case with the first edge-rails, were entirely reinstated with heavier rails after a few years' traffic had been allowed fully to test them. The bridge-rail is still used on the Great Western Railway and some other lines; but the double parallel rail, of similar section both at top and bottom, may be considered the standard form, and is to be found on almost all the lines laid down to the national gauge of 4 feet 8½ inches.

As the Liverpool and Manchester was the great experimental line, so it was the standard for the great lines that followed it; and the faults committed in its construction were unfortunately copied by the engineers under whose direction the subsequent lines were constructed. Thus we found, in all railways north of the Thames, stone blocks to support the rails in those parts of the way which either were on the surface of the ground or in excavations, more familiarly known as cuttings; while Mr. Giles, who stood almost alone in his view of what a permanent way should consist, adopted transverse sleepers of wood for the Southampton Railway, now called the South-Western. He had two reasons for adopting wooden sleepers—the first on account of the railway passing through a country abounding with suitable timber; and the other on account of the greater facility of keeping the permanent way in order; and perhaps he might have considered a third and very satisfactory reason; viz. that of the greater amount of destruction which would take place to the locomotive engines and carriages in passing over the rigid way constructed with the stone blocks. Be this as it may, Mr. Giles's plan, modified as to fastenings, came into general use in most of the narrow guage lines, and the massive granite blocks were seen, after a few years, lying along several of the main trunk-lines, to be removed at a great sacrifice. Except the gauge of way, and perhaps the fencing, there is scarcely any part of the narrow gauge railway which is not widely different from that which presented itself when first constructed: and now, after ten or twelve years' experience, it seems likely, that on some lines the transverse sleepers of wood will be replaced with sleepers of cast iron. Perhaps the Great Western permanent way is less changed than any other, with the exception already alluded to, of the increased weight of rail.

We need say nothing about the gross errors committed by the first railway engineers in point of estimates. Unfortunately, that great fact is too well known to thousands "who lent their money in aid of the national prosperity." Having thus introduced the subject of permanent way, we may now mention the names of those persons who, as exhibitors at the Great Exhibition, have brought forward what they consider improved methods of laying down the permanent way, and different forms of rails, chairs, sleepers, &c.

The Brothers Barlow, J. W. Hoby, H. Greaves, J. Samuel, Joseph Cubitt, and Cantwell & Co., are the engineers who laid down in the railway department of the World's Fair various forms of permanent way, some of which were at the time under trial on two or more trunk lines. As P. W. Barlow stands first in the Official Catalogue, we shall commence with his "Cast-iron Permanent Way." Mr. P. W. Barlow has had considerable experience in railway construction, having been connected with the South-Eastern from its very commencement, under Mr. Palmer. He must also have had abundant opportunities of discovering the defects in the permanent way so long in use on his own line. It is fair, therefore, to suppose, that not merely for the sake of novelty, but for the sake of economy and other weighty reasons he has brought forward his cast-iron permanent way. The cast-iron chairs, or pedestals, to which the rails are fixed, are usually secured to the transverse wooden sleepers, but, in the present instance, are cast on to a large base plate of the same material, which the inventor calls a sleeper. The intermediate chairs are in pairs; at the joints there are two ordinary chairs, the same as those placed intermediately, and one joint chair to receive the ends of the two meeting rails. At each of the joints there is a transverse tie of iron, to bind the whole together, and to prevent the rails from spreading. By this plan wooden keys are rendered unnecessary; and Mr. Barlow considers that he shall obtain greater durability by his new plan, and mentions, in addition to this important advantage, that an additional number of supports is obtained for the rails.

Mr. W. H. Barlow, engineer of the Midland Railways, goes even farther than his brother, as, by his "wrought-iron permanent way," he boldly casts on one side sleepers, chairs, and wedges, and introduces bridge rails in 18 feet lengths, and having a base taken transversely of 11 inches, the rail being made "to form its own bearing surface in the ballasting;" the top of the rail on which the wheels run is 2½ inches wide, and the thickness of the base or bottom flanges half an inch. At the joints, cross tiers of iron, 2½ inches in width, are introduced to bind the two lines of rails together. We had almost forgotten that the permanent way of the Great Western Railway was laid down at the Exhibition to receive the mighty locomotive engine described on another occasion, consisting of longitudinal sleepers and bridge rails bolted down thereto.

H. Greaves' plan of cast-iron permanent way differs from that of Mr. P. W. Barlow, though he evidently has the same objects in view. His chairs and sleepers are also cast together, the latter being in form semi-spherical: the joints of rails are secured together by coupling-pieces. Wooden keys are used to wedge in the bridge-formed rails to the chairs. We are not aware of the relative cost of Mr. Greaves' plan as compared with that of Mr. P. W. Barlow. We, however, prefer on the whole, the plan of the last-named gentleman.

Here is another plan to get rid of the wooden sleepers, though the exhibitor, Mr. Samuel, formerly engineer on the Eastern Counties Railway, still uses wood in the shape of wedges. He calls his the "patent cast-iron timber-bedded wedge trough permanent way." In this case the rails are laid in cast-iron troughs, and secured therein by wooden wedges. The troughs, which are formed of two inclined sides, are strengthened by segmental flanges underneath, the whole being well bedded in the ballasting. By means of iron fish-pieces connected with the chairs, two ends of contiguous rails are secured firmly together, the fish-pieces having proper perforations for the connecting-bolts to pass through.

Lastly, we shall mention Mr. Joseph Cubitt's permanent way, which, however, is not quite so new as the others; yet we believe it has been found to answer as well as any of the transverse wooden sleeper plans, after some years' trial on the South-Eastern Railway. The novelty of Cubitt's plan consists in the form of sleeper, which in cross section is triangular; thus, two lengths of sleepers are cut out of a baulk of timber. The base of the triangle being placed uppermost, the chairs—in the present instance, Ransome and May's, with their patent trenails and wedges—are firmly secured thereto. Of all the plans exhibited in Hyde Park, we certainly prefer that of W. H. Barlow, which is by far the most simple and certainly very durable. The rigidity of all the iron permanent ways exhibited may, however, yet be found to do more mischief to the "rolling stock" than can be compensated for in the annual saving effected by the permanent way itself.

The next item in the list of railway plant which we shall mention is the turn-table or turn-plate, and the more modern traverser or traversing-table. There were several exhibitors in this class of railway appurtenances, including the well-known names of Dunn, and Ransomes & May respectively; the other exhibitors were R. Ormerod & Son, J. G. Leadbetter, C. Greenway, and A. Allan, of Crewe. Before describing the best of these inventions, we will inform those of our readers who have hitherto paid no attention to the details of railway construction, that a turn-plate (or turning platform), according to Wishaw's "Analysis of Railways" "is a horizontal and circular frame of wood, moveable on a centre; it is furnished with a floor of the same material, on which are fixed short rails at a gauge corresponding with that of the railway where it is set up: the use of this contrivance is to alter the direction of an engine or carriage from one line of way to another." The above description was quite correct at the time it was written; but turn-tables are now chiefly made of iron. At the Liverpool and Manchester Railway depots, the original turn-tables were of 5 feet diameter, and answered to the above description; while, on the Stockton and Darlington Railway, the diameter was 10 feet. At the present time they are made of sufficient size to turn the largest engines and tenders together, though, on the Great Western, the engineer of which would not follow the beaten track, traversing tables were introduced to answer the same purpose as that of turn-tables; and as their success was proved by years of trial, new forms of traversing-tables have been patented by Mr. Dunn and Messrs. Ormerod.

The Great Western Railway Company, in addition to their permanent

APPLEGATH'S VERTICAL PRINTING MACHINE.

EXHIBITED BY THE PROPRIETORS OF "THE ILLUSTRATED LONDON NEWS."

ONE of the greatest lions in the Great Exhibition, and which, perhaps, attracted daily more curious admirers than the Koh-i-Noor itself, was the Printing-Machine of the *Illustrated London News* exhibited by the proprietors of that Journal. This interesting piece of machinery, which was kept in motion throughout the day, throwing off sheets at the rate of 3000 per hour, was erected by Mr. Applegath, who had previously constructed a somewhat similar machine for the *Times* newspaper. The enormous sale of the *Illustrated London News*, which has reached the number of 200,000 copies a week, rendered this outlay necessary, and of comparatively slight importance, the Exhibition machine being only one of very many employed simultaneously in working off the large weekly issue. This issue, when there was a treble number, which was sometimes the case, amounted to 600,000 sheets of paper. The following particulars are abridged from the account given in the *Illustrated London News* of May 31, 1851:—

"It must be convincing to our readers that the task we have weekly to perform—of conveying the *most recent intelligence* by a *real representation*, is far more difficult than merely setting up in type a few sentences, which may be effected in a very short time, and issued from the press almost immediately afterwards. Very different is our task. The object to be artistically represented, at whatever distance from the printing-office, *must* be seen by the artist, and *must* then be rapidly, as well as faithfully, transferred to the wooden block to be engraved, and which, by an ingenious division of labour, is accomplished in an inconceivably short space of time. It must be remembered, that the wood-cuts, once engraved, can neither be increased nor decreased in size, nor can any material alteration be made therein.

"When the wood-cuts and type are got into the requisite dimensions, the pages are fixed in the iron frames or *chases*, and are transferred to the printing-machine, for the purpose, in the first instance, of undergoing a very important and delicate operation called "overlaying," by which the pressure is diminished in the lighter parts of the engravings and increased in the dark shadows, without attention to which the artistic effects would be entirely lost. This overlaying is sometimes a very tedious and difficult process. While all those preliminaries are in progress, the hour of 'going to press' is rapidly advancing; and although more time might often be very profitably employed in giving the best possible effects to the cuts, so as to gratify not only the public, but the artist himself, yet in order to throw off the requisite number of copies within a limited period, all other considerations must be set aside. Thus between the desire of delineating the most recent objects of public interest, and that of producing them in large quantities, and at the same time in the most artistic style, a kind of antagonism has existed, which has only been neutralised by the most intense exertions on the part of all concerned; and we now venture to hope that the difficulties we have to contend with will entirely be done away with, as the improved machinery, by its increased power of production, will render such impediments less likely to occur.

"We now proceed to furnish our readers with some account of the Applegath Vertical Printing Machine, which has already attracted crowds of visitors from some of the more generally enticing sections of the Great Exhibition.

"The chief novelties of this machine are, first, the type being placed around a large cylinder, placed vertically, thus leaving impressions on several sheets of paper at each revolution, and second, that by such arrangement, a far greater number of copies can be produced within a given time than by any reciprocating machine as yet invented.

"As this machine is calculated to throw off four impressions for each revolution of the cylinder, it is necessary to introduce as many sheets of blank paper at the same time. This is done by the "layer-on," who draws a sheet towards the upper rollers, when a small iron spindle furnished with brass pulleys, revolving at considerable velocity, descends upon it, causing it to pass between the sets of vertical tapes, which carry it down to a point at which its course is altered by narrow upright pieces of wood, called "stoppers," which advance and compress the sheet of paper between them, the vertical tapes at the same time receding from the paper. In the next place, the stoppers recede, and the paper is momentarily suspended between small pulleys, mounted on delicate springs, called "finger-rollers." The sheet is now impelled towards the impressing cylinder by means of vertical rollers in rapid motion on either side of the sheet, which is secured by the ordinary marginal tapes, and, passing round the impressing cylinder, receives an impression from the type fixed in the great vertical cylinder. The sheet, thus printed, passes towards the "taking-off" table, being supported in its progress by the upper pair of tapes, which are stopped at the proper time, leaving the sheet suspended between two small spring pulleys above it, until the "taker-off" removes it to the table.

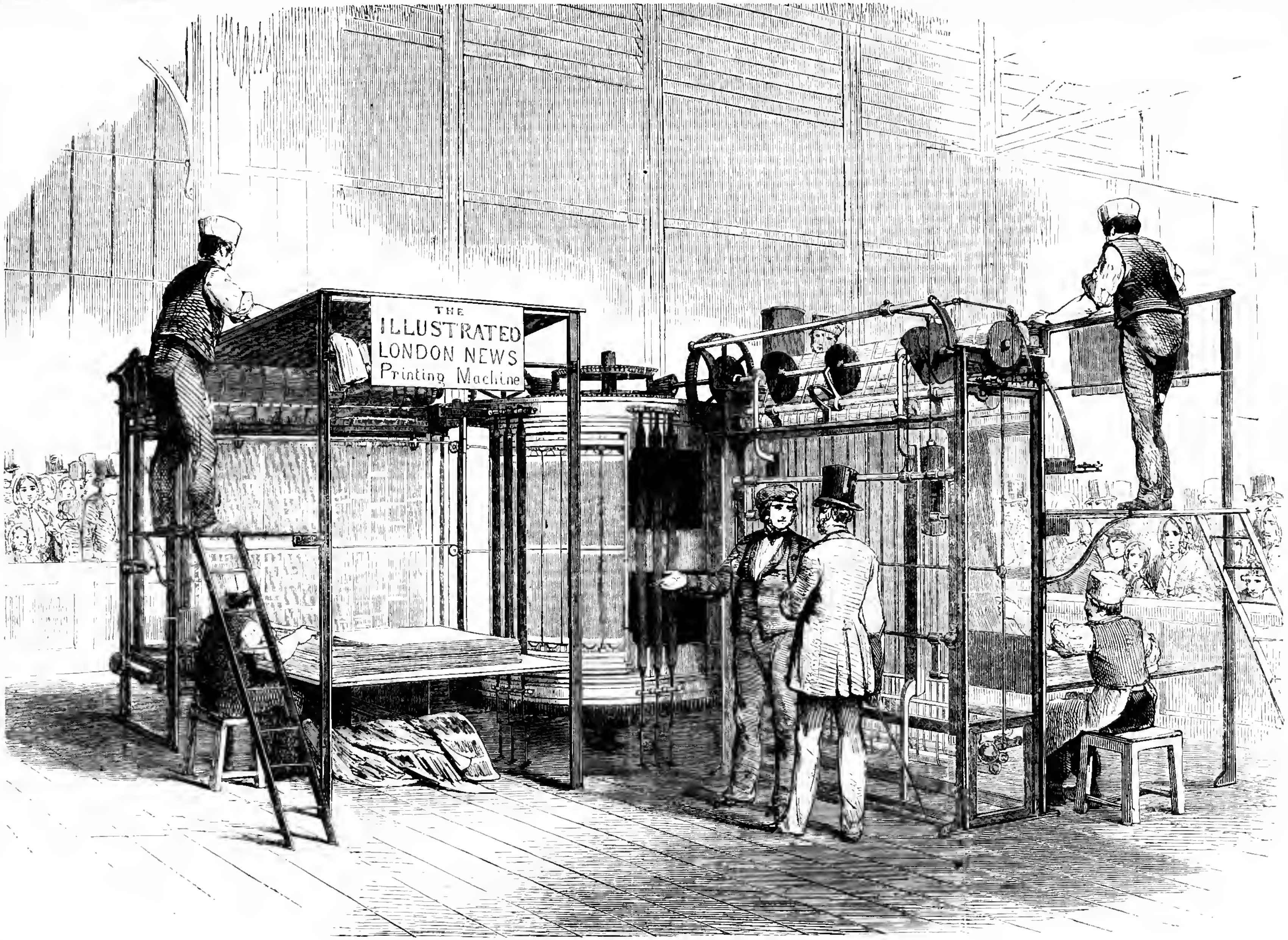
"The type cylinder, which is really the great feature of the invention, consists of three strong circular rings of cast iron, securely keyed to an upright spindle. The segmental chaces, which contain the type and wood-cuts, are attached to the circular rings by screws.

"During the revolution of the type cylinder, it comes in contact with four printing cylinders, each of which is exactly one-fourth of its diameter. The printing cylinders work into the type cylinder by means of toothed wheels placed beneath them.

"The surface of the impressing cylinders is made partly of fine woollen cloth, and partly of paper or from card board, reduced in those parts requiring the overlaying, by cutting or scraping, according to the thickness required. The ink is carefully spread over a circular invert opposite to the type and connected to the vertical spindle of the type cylinder by hinged arms resting on an upright bar which is terminated by a pulley. This pulley acts upon a circular undulating railway fixed below the type cylinder, and from which the distributing surface receives a slight up-and-down motion as it revolves. The distributing surface is fed with ink by means of vibratory rollers which continue in action between it and the upright ink boxes placed under the copper reservoirs.

"The contact of the inking-rollers with the type is regulated by long coiled springs connected with the bearings, so that they merely touch the surface of the letters, which is one of the great advantages of the vertical portion of the machine. To show the advantage of this arrangement, it is only necessary to mention, that in the case of the *Times* machine, 40,000 impressions have been taken without any difference being discovered between the first and the last. Another advantage of the vertical machine is, that the dust or small particles adhering to the paper are shaken from it when suddenly stopped, and fall to the floor instead of being deposited upon the form or distributing table, as in the case of horizontal machines.

"Mr. Applegath is still occupied in making further improvements in this valuable invention, with a view to render it suitable for the printing business generally."



ILLUSTRATED LONDON NEWS PRINTING MACHINE.

CRYSTALLISED SALTS.

Continued from page 323.

SULPHATE of copper, commercially known by the name of blue vitriol, is a substance commonly prepared by dissolving oxide of copper in sulphuric acid, and subsequently evaporating down the liquor so obtained, in order to separate the blue vitriol by crystallisation. A small quantity of sulphate of copper is also obtained during the roasting of certain ores of copper, and, being a soluble salt, it is readily removed from the roasted heaps by lixiviation, and may be then crystallised in the usual way.

Blue vitriol sometimes occurs in a native form in mines containing copper pyrites, which is a double sulphuret of iron and copper; this readily becomes oxidised by exposure, and being by this means transformed into the soluble sulphate, the waters of the majority of our copper mines become more or less impregnated with this salt.

By far the larger proportion of the sulphate of copper used in commerce is, however, prepared directly by the addition of sulphuric acid to the oxide of that metal. The oxide is either obtained from the rolling mills where sheet-copper is laminated, or it is made by roasting in a reverberatory furnace the worn-out copper sheeting which has served for covering ships' bottoms. The oxide obtained by either of these methods is first heated in a large leaden vessel with a proper quantity of dilute sulphuric acid; and when the whole of the soluble matter has been taken up, the liquor is first allowed to settle, and is then drawn off whilst still hot, into large tubs lined with lead, around the sides and bottom of which the blue salt rapidly crystallises. In order that the crystals may be well formed, these vessels are protected from a too rapid loss of heat by being carefully covered over, and surrounded with matting or sawdust, by which the radiation and conduction of their heat is considerably diminished, and crystals of a proportionately larger size are obtained. It is also necessary that, besides being placed in a warm room, the tubs should be kept as free as possible from all motion, as the shaking of the solutions is invariably found to determine the precipitation of the salt on the bottom of the vessel in the form of a granular powder. At the bottom of the dissolving tub a greater or less deposit of insoluble matter is always found to take place. This which consists of metallic copper, is not readily attacked by sulphuric acid so much diluted as that ordinarily employed, and it is, therefore, after a time, removed from the dissolving vessel, and heated in a reverberatory furnace for the purpose of converting it into the soluble oxide.

In some cases—and particularly in many parts of the Continent of Europe—sulphate of copper is produced by the direct combination of copper, sulphur and oxygen. The metal most employed for this purpose is the old coppering of vessels which has become so much worn and acted on by the sea water as to require removal. These worn-out sheets are heated to dull redness in a properly constructed reverberatory furnace, and sulphur is thrown in, all the openings of the apparatus being carefully closed up. By this means the metal is rapidly acted on by the sulphur, and di-sulphuret of copper is quickly formed.

These sulphuretted sheets are afterwards roasted in the same furnace, with free access of air, which converts the sulphur into sulphuric acid, and a sub-sulphate of the oxide of copper is formed. At this point of the operation the subsalt is withdrawn from the apparatus, and, after being allowed to cool, is heated, with a proper quantity of dilute sulphuric acid, in large leaden vessels, where it is converted into the neutral sulphate of protoxide of copper. The liquid from these leaden cisterns is concentrated and crystallised in the usual way, and the mother liquors which remain in the tub after the first crystallisation are again evaporated, and a new batch of crystals obtained. After being separately treated in this way, the mother waters become too strongly acid to yield good crystals, and they are then employed in the place of sulphuric acid, to effect the solution of the subsalt of copper, which is acted on in the leaden tanks above described. Sulphate of copper crystallises with five atoms of water, and is soluble in four times its weight of cold, and in twice its weight of boiling, water.

This salt is largely employed in the manufacture of the colour called emerald green. It is also much used for galvano-plastic purposes, and as a cautery in medicine. A weak solution is also sometimes made use of by farmers for the purpose of steeping seeds before they are sown, in order to protect them from the attacks of insects and vermin.

Among the specimens exhibited we remarked some beautiful crystal from the works of Messrs. Pontifex and Wood, of London, and from those of Messrs. Hahnel and Ellis, of Manchester, whose cases contain several fine examples of this substance, which had been made to crystallise in masses having various fanciful forms.

The various salts of lead were fully represented in this department. Nitrate of lead—of which some fine groups of crystals were exhibited by Mr. W. Dentith and Messrs Hahnel and Ellis, of Manchester—is prepared by dissolving protoxide of lead, more commonly known as litharge, in dilute nitric acid, and subsequently concentrating and crystallising the solution. The evaporation, which is carried on in stoneware vessels heated by a sand bath, is continued until a pellicle appears on the surface of the liquor, when it is drawn off into other earthen pans, where, on cooling, it deposits a crop of octahedral crystals. These are sometimes perfectly transparent, but are more frequently white and opaque. Nitrate of lead is largely employed in the manufacture of the chromates of lead used as yellow pigments, and also in some particular styles of calico-printing.

Of the acetate of lead, another important salt of this metal, we found some most magnificent examples on the table of this section. The most beautiful of these were exhibited by the Messrs. Perez, of Limehouse, and the Melincrythan Chemical Works, near Neath, South Wales. The crystals from the latter place were beautifully white, and of extreme purity, and may be regarded as the perfection of manufacturing chemistry, as applied to the salts of lead.

Acetate of lead—or, as it is more frequently called, sugar of lead—is prepared by dissolving pure litharge, by the aid of heat, in strong vinegar, made from either malt, wood, or wine, until the acid is saturated, and by subsequently concentrating and crystallising the solution in the way before described. The combination of the acid and litharge may be made either in a copper boiler rendered negatively electrical by soldering a strap of lead along its bottom, or, what is still better, in vessels made of thick sheet-lead; in which case it is necessary to keep the liquor constantly slightly acid, in order to prevent the formation of any of the numerous subsalts which would otherwise be produced. When the concentrated liquors have a yellow colour, as is usually the case when the acid employed is not of great purity, the solution should be filtered through animal charcoal, by which the colouring matter is entirely removed; and the filtrate which passes through into the reservoirs, placed beneath the filters, is then in a state for immediate concentration and crystallisation.

Salt-glazed stoneware vessels are those best adapted for the crystallisation of sugar of lead, and the edges of these should be smeared over with grease or tallow, to prevent the salt from creeping over them by efflorescent vegetation.

When the mother waters cease to yield good crystals by evaporation, they are decomposed by carbonate of soda, or lime, carefully applied—by which a carbonate, or oxide, is obtained, fit to be treated with a fresh quantity of acid or vinegar. Acetate of lead is a poisonous salt, having no smell, but a sweetish taste, not unlike that of sugar; and from hence its common name, sugar of lead. It is much used for calico-printing, and is also sometimes employed in the preparation of the chromates of lead, constituting the ordinary yellow pigments of the house-painter and artist: but for this purpose it is inferior to the nitrate of the same metal, which affords chromates having a much brighter tint.

Another very beautiful salt, of which some most magnificent specimens were exhibited, is the bi-chromate of potash, which affords large crystals of a bright red colour. This substance is produced by the calcination of a mixture of chrome iron ore and nitre, and the subsequent treatment of the liquors obtained by the lixiviation of the roasted mass. Chrome ore or chrome iron occurs in large quantities near Baltimore in Maryland, in the Shetland Isles, in the department of Var in France, near Portsey in Banffshire, and also in Bohemia and Silesia. To prepare bi-chromate of potash from this mineral, it is first carefully separated from the gangue with which it is found associated, and it is subsequently ground under heavy edge-runners to the state of a very finely divided meal. It is then mixed with from one-third to one-half its weight of pulverised nitre, and exposed to a strong heat, during several successive hours, on the hearth of a reverberating furnace, where it is occasionally stirred about with iron bars and rakes. When the calcination is judged to be sufficiently advanced, the charge of the furnace is withdrawn, while still hot, into vessels containing water, in which the soluble salts which it now contains are extracted by repeated washings.

The bright yellow solution which is thus obtained is now evaporated briskly, and chromate of potash, in the form of granular crystals, is rapidly deposited: these are separated from the mother liquor by the use of a perforated ladle, and the concentration of the liquors quickly gives rise to the precipitation of a fresh amount. Regularly formed crystals of the neutral chromate of potash may be obtained by dissolving this saline powder in water, and slowly evaporating the solution: but these liquors are more frequently treated with some other acid, such as nitric or acetic, in order that it may combine with a portion of the alkali present, and determine the formation of the red bi-chromate of potash, which is so extensively employed in many branches of the arts. After the addition of the acid, which, for the purposes of the manufacturer, is frequently either acetic or hydrochloric, the liquors are concentrated by a slow and regular evaporation, and crystals of the red bi-chromate are abundantly produced on cooling the solution. This substance is principally employed by colour-makers and dyers, who obtain from it some very beautiful dyes and pigments by the addition of a soluble salt of lead. A green oxide of chromium is also prepared by the decomposition of chromate of mercury by heat. This salt is obtained by adding nitrate of protoxide of mercury to chromate of potash in equal proportions; and the oxide which remains when this substance is heated to redness is principally applied to dyeing and painting in porcelain.

The specimens of bi-chromate of potash exhibited were, many of them, of large size and great beauty. Some of the best illustrations of this salt were furnished by Messrs. Denteith, of Manchester, who also exhibited some fine samples of prussiate of potash, and other chemical substances connected with the manufacture of pigments and colouring matters.

This salt, which is largely employed for manufacturing purposes, is prin-

way and locomotive engine, also exhibited their traversing table—consisting of an oblong frame of iron with platform of the same material, and shelvings, one on either side, to receive the wheels of the engine and carriage to be removed from one line of way to another. Small friction wheels placed at right angles to the length of the traverser, fixed in proper bearings, enable the machine to be moved on rails laid transversely between the two ways. The end of each shelving place is slightly inclined towards the ordinary bridge rail, in order to enable the engine or carriage respectively to be moved on to or from the traverser when required.

Mr. Dunn exhibited not only a model of his "improved mode of removing railway carriages from one line to another," but also contributed his apparatus to full size, so that the ease with which it may be worked could be tested by those visitors who were interested in the subject. Dunn's traverser is constructed of wrought iron, and is generally introduced at passenger stations for transferring six-wheeled carriages from one line to another. The ends of the shelvings, which are inclined, are attached to the traverser by spiral joints, so that when—to get them out of the way—they are folded back against the ends of the machine, they are sufficiently elevated above the rails. For each line of cross-way there are four wheels, so arranged that in passing over the flange-gap of the cross-rails, the traverser is always supported by three wheels, so that jerks are thereby avoided. The shelving in this form of traverser is only two inches above the permanent way. As in introducing the traverser to an old line of railway no alteration is required in the permanent way, it is evidently more desirable than the ordinary turn-table for such purpose.

Another form of traversing-table, according to Mr. Dunn's patent, consists in forming the shelvings in such a way that one end of each can be lowered down to meet the rail, thus forming an inclined plane equal to the whole length of the machine, with a rise of $1\frac{3}{4}$ inch; or, if considered desirable, both ends of the traverser can be lowered, so that the carriage may be rolled on without the aid of inclined planes or points. The form we have just described is suited for heavy luggage vans, and also for long passenger carriages.

The third form of traversing-table, introduced by Mr. Dunn, is intended particularly for locomotive engines and hopper coal-waggons, or other carriages of considerable weight, as the load has not to be raised perpendicularly, nor moved up an inclined plane. The mode of accomplishing this desirable object is attained by depressing a portion of the permanent way, the traverser thus working on a sinking of about three inches deep. The whole is raised to its proper level by strong wedge-beams, or cams. In each of these forms the shelvings are brought nearly to the level of the permanent rails, which is an important feature in Mr. Dunn's invention.

Messrs. Ormerod & Son, also of Manchester, exhibited Dunn's patent turn-table, on account of its rigidity and total absence of deflection, owing to longitudinal sleepers being fixed underneath the table in the line of the permanent rails.

Messrs. Ransomes & May, of Ipswich, exhibited Wild's railway turn-table, and also Barlow and Heald's invention for the same purpose; that of Wild was placed in a cast iron frame or kerb, the table turning on a centre, and running on twelve friction rollers.

The improvement in Mr. C. Greenway's turn-table consists in the construction of the cradle underneath the platform, arranged in compartments radially placed, which contains alternately balls or spheres, and friction wheels, by which the motion is rendered easy: the table turns, as usual, on a centre pivot in proper bearings.

A. Allan, who is connected with the North-Western Company's locomotive establishment at Crewe, exhibited a model of his hydrostatic or floating turn-table. Turn-tables on this principle are not new, but the details of Mr. Allan's invention constitute his invention. The model exhibited represents a turn-table of 40 feet diameter; the platform or floor is supported by wooden trusses, 4 feet 4 inches in depth, having three lines of rails across it. An engine and tender may be transposed from one of the side-ways to the other, the position of the engine being of course reversed. "If," says the inventor, "water is admitted so as not to have any upward pressure at all, a load of 35 tons may safely rest on the table, the sinking being inappreciable. The table turns on a central pivot, and the water is supplied from a tank placed on one side of the railway."

SIGNALS.—The various accidents which happened to railway trains for some years after their introduction, caused inventors and others to devise plans for obviating the disastrous consequences of railway collision. The old semaphore, or arm-telegraph, in use in this country before the introduction of the more modern system of transmitting signals, naturally presented itself as a ready means of transmitting signals along a line of railway for short distances; and we believe Mr. Chas. Hutton Gregory, formerly engineer to the Croydon line, and now to the Bristol and Exeter, was the first to introduce this obviously useful plan of communication between certain points on the Croydon Railway and the different stations; and what is done by the moveable arms, jointed so as to be moved in different directions, in the day-time, is effected at night by lamps of various colours. This kind of railway telegraph was shown to full scale at the Exhibition, being contributed by the manufacturers, Stevens and Son, of Southwark, who have, somehow or other, been particularly fortunate in introducing this useful railway appendage in most parts of the kingdom. They also exhibited a modification of the above, which they call a double station signal, by which a greater number of signals may be transmitted.

The other exhibitors of signals were—J. Cooley, of Spalding; J. Steven of the St. Leonard station, Edinburgh; J. H. Lockyer, of Leicester; De Fontaine and C. A. King, of London respectively; J. Copling, of Hackney; E. A. Cowper, of Kensington; W. Hattersley, of London; R. Tidmarsh, of Bermondsey; T. B. Pearce of London; J. Hoy, of Paddington; T. Watson, of London; and J. Shaw & Co., of Huddersfield; altogether fourteen contributions, showing the interest which is still alive on this subject. The signals exhibited, and which have been tested for years, were the semaphores of Stevens and Son, already mentioned, and the fog-signals of Cowper. In foggy weather it is indeed very difficult to steer clear of accidents on railways; but by the use of the last-named signals much mischief is likely to be prevented. The inventor calls them detonating fog-signals, as powder forms the principal part of the contrivance. The powder is placed in tin boxes, about two inches diameter, and about half an inch thick; in connexion with the powder is a match, which, being placed on one of the rails at any point that may be desired, causes an explosion on the first wheel of a train passing over it, so that it gives warning to the drivers and guards of something being wrong or out of order in that part of the way; a slip of lead is soldered to the box, by which it is secured to the rail.

William Fourness' alarum for locomotive engines is sounded by means of the action of the steam on metallic reeds. We have not heard whether this has been practically tested—the idea seems good. The other signals exhibited are more or less curious.

We had almost forgotten a practical mode of communicating between guard and driver, as exhibited in the middle gallery north, by Mr. Whishaw, whose invention, called the Telekouphonon, or Speaking Telegraph, consisting of a tube with mouth-pieces furnished with whistles to call attention, was successfully applied on the Birmingham and Shrewsbury Railway. The same gentleman proposed a method of communicating between guard and driver, in 1840, by means of a wire or rope, with cranks or pulleys respectively, in connexion with an alarum fixed on the tender. This plan is in daily use on some of the Prussian railways.

The other articles exhibited in the Railway Department of the Great Exhibition, and which come under the denomination of railway plant, were switches and crossings, contributed by Mr. Parsons, C. E.; W. Baines, of Birmingham; and R. W. Kennard, of Falkirk, N. B.; a water crane, of simple, but substantial form, exhibited by Ransomes & May, and compressed trenails, by the same firm, who carry on an immense business in railway plant of all sorts. Then there were the "simultaneously-acting level-crossing gates of C. Young & Co., of Edinburgh, and the several screw-jacks of Collinge & Co.; G. England; H. Bayman; Haley; and Gladstone. No train should travel without one of these useful machines, for, in the event of a train getting off the way, they are invaluable.

Finally, we were struck with an improved method of transferring letter-bags on railways, by J. Dicker, of Islington. On the Grand Junction Railway, as it was formerly called, a contrivance for a similar purpose was tried for some time, but discontinued after a fair trial. In the present apparatus, the operation appears to be performed in the most complete manner at the different post-office stations along the line. The bags are exchanged without chance of failure. This is effected by a jointed lever projecting from the side of the post-office carriage, on which the bag to be left at the station is suspended, and which, on arriving at the station, is caught in a net, while that to be sent forward by the train in a similar manner, is caught by a net attached to the carriage.

THE ROSE WATCH. BY J. JONES, STRAND.

SUCH is the name under which Mr. Jones exhibited a very beautifully mounted watch, the decoration of which is intended to be suggestive throughout. On one half of the margin around the back is engraved, on blue enamel, "Man cometh forth as a flower, and is cut down." On the surface of the richly-engraved gold back is a Maltese cross, in white enamel; and on its four limbs are depicted the four seasons of life, in the bud, blossom, decay, and death of a rose. On the other half of the margin is engraved, "It is sown in dishonour, it is raised in glory." In the centre of the cross is a celestial crown of diamonds, on a blue enamel ground, surrounded by an Olympic wreath of pearls, with rays of glory in enamel, radiating between the limbs of the cross. The dial represents, in enamel colours, the rose window of Westminster Abbey. On the twelve compartments indicating the twelve hours are the names of the twelve Apostles. On the bezel that holds the glass is engraved, in blue enamel, "He that taketh not his cross *daily* is not worthy of me.'—(*The "Rose of Sharon."*)

ually prepared by the following process. A large egg-shaped pot of cast on is built into a furnace, so as to admit of being readily heated to redness means of a fire placed on bars situated immediately beneath it. When is vessel has been brought to a moderate state of ignition, a mixture of od pearlash and dry animal matters—of which hoof, horn, woollen rags, d the substance called greaves, which is the refuse of tallow melters, form principal part—is projected into it. The proportions usually adopted are o parts of pearlash to five parts of nitrogenised animal matter; and this xture, as it calcines, will be found gradually to assume a thick pasty form, ring the progress of which transformation it must be kept constantly rred about with a long iron bar. During the whole of this stage of the eration a very offensive odour is given off from the retort, but when the xture has become wholly converted into a chemical compound, the olution of the fœtid animal vapours entirely ceases; and the pasty mass is w quickly withdrawn from the heated vessel by an iron lle, and allowed to cool before being subjected to any ther treatment.

If the charge of the retort were thrown, while still hot, o water, for the purpose of more readily effecting its solu- n, some of the prussic acid present would be instantly nverted into ammonia, and the usual crystallised product uld be diminished in a proportionate degree. When quite ld the solid matter is dissolved in water, and the solution rified either by subsidence or ration; the liquors thus ob- ned are subsequently concen- ted by evaporation, and, on ng allowed to cool, deposit large llow crystals of the ferro-prus- te of potash on the sides of the sels into which they are poured. ien large and pure crystals of salt are required, the granular posit is again dissolved in the ter, and it then lds, when al- ed to cool slow- fine and very ular crystals prussiate of tash.

In the second ystallisation of e impure salt, e cooling of the ussiate liquors allowed to go very slowly, being usually out a fort- ht before e contents the cool- s are dis- rbed.

The per- ntage com- sition of llow prus- te of pot- h is as fol- ws:—Potassium ·02, iron 12·83, anogen 37·40, ter 12·76; and is salt in its hydrous state may consequently be regarded as a compound of one om of cyanide of iron, united to two equivalents of cyanide of potassium. e iron necessary to the production of this substance is derived from the t and stirrers used in the operation, and these, therefore, are found to much corroded and worn away by use. The lower part of the retort, ere it comes most in contact with the mass of fused animal matters, is pecially subject to be thus acted on, and it is therefore frequently found cessary to turn the pots in the furnace, so that the parts acted on may placed uppermost, and further removed from the corrosive action of the arges.

This salt is very largely employed for the manufacture of the colour lled Prussian blue, which forms the basis of the different blue stains and gments so extensively used in many branches of the arts.

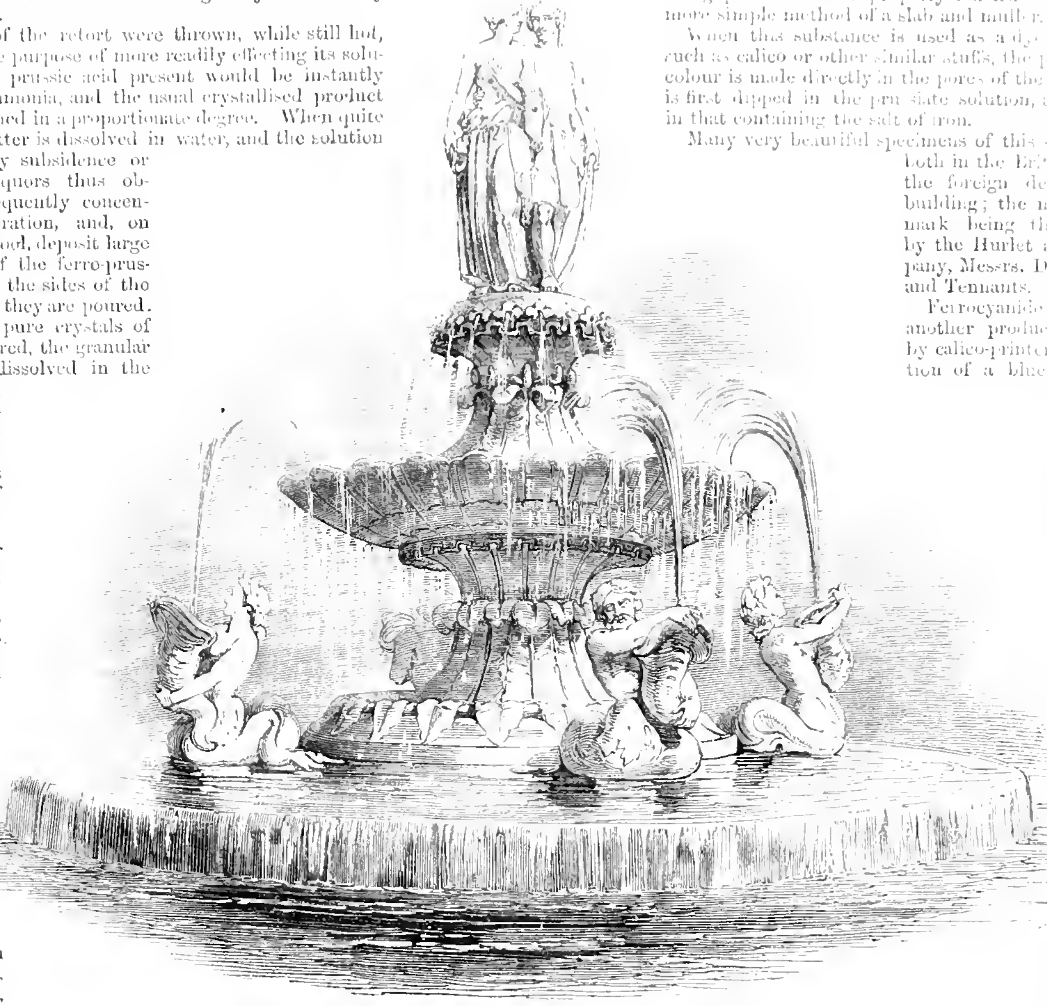
When a solution of ferrocyanide of potassium is added to a salt of the roxide of iron, a copious deposit of a beautiful blue colour is immediately termined, which may be regarded as a double cyanide of the protoxide and roxide of iron. This substance is the Prussian blue of commerce, and is ost extensively employed as a pigment, and also for imparting a blue lour to woven fabrics, such as cloths and cotton goods.

On account of its cheapness, green sulphate of iron is constantly employed the manufacturer in the preparation of Prussian blue; but the red sulphate, nitrate, or chloride, affords a pigment [illegible]. The Prussian blue obtained by the admixture of [illegible] potash has also a peculiar bronzed appearance, [illegible] greatly esteemed among colour makers, who, in order to produce [illegible] a portion of the red solution, are in the habit of adding to it a small quantity either of nitric acid or the bichromate of potash, of which a very small amount is found sufficient when the two solutions are boiled together during a considerable time. When Prussian blue is to be ground in oil and afterwards used as an ordinary pigment, the precipitate, after being well washed by decantation in the vessels in which it has been precipitated, is collected on a filter of twilled calico, from which it is subsequently removed to a powerful screw press, by which the greater part of its moisture is squeezed out. The pasty mass is then taken to a stove, where the process of drying is completed; and, when the whole of the moisture has been thus eliminated, the dried Prussian blue is ground in oil in the usual way, either by being passed between properly constructed mills, or by the more simple method of a slab and muller.

When this substance is used as a dye for textile fabrics, such as calico or other similar stuffs, the precipitation of the colour is made directly in the pores of the cloth itself, which is first dipped in the prussiate solution, and is then placed in that containing the salt of iron.

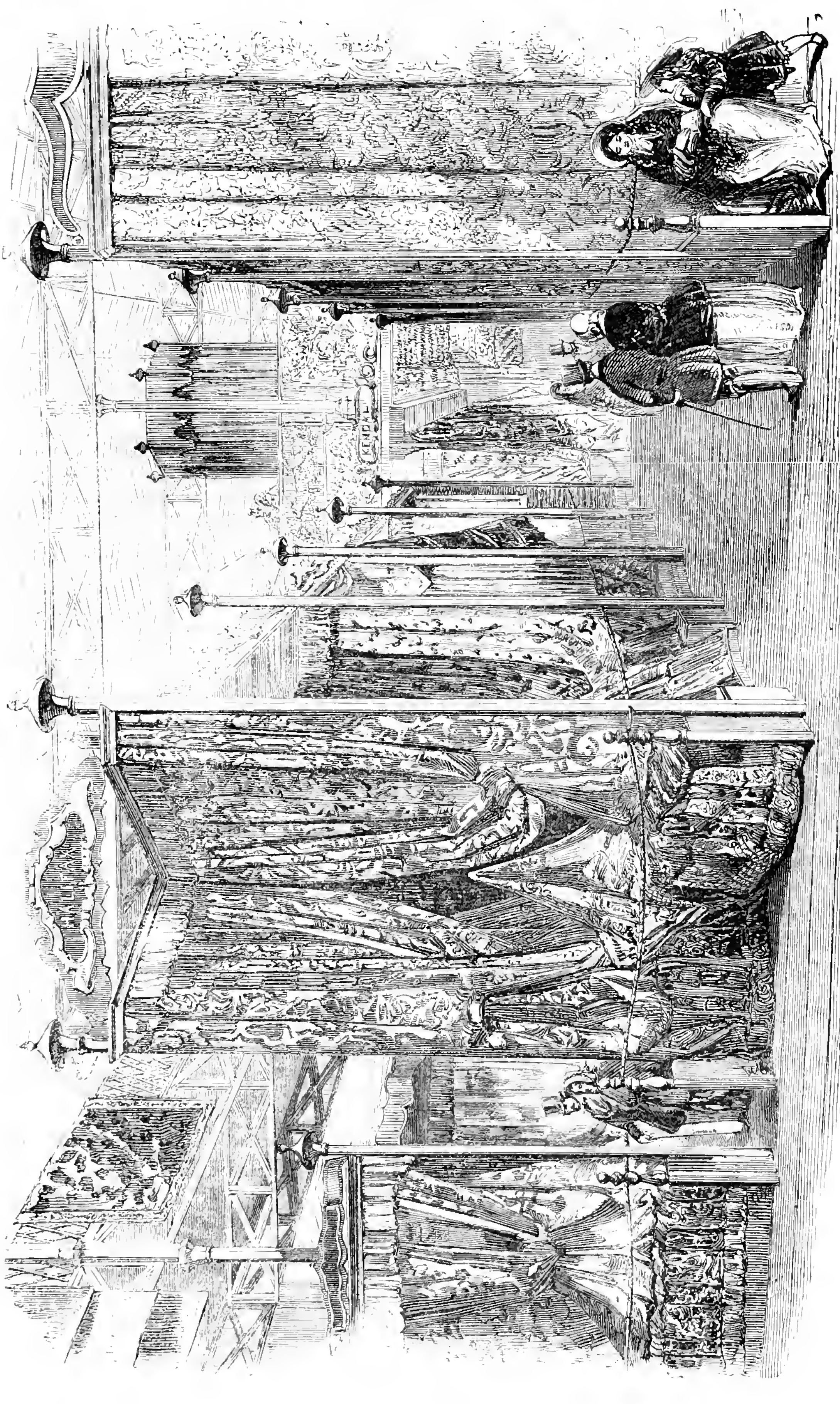
Many very beautiful specimens of this salt were exhibited both in the British and in some of the foreign departments of the building; the most worthy of remark being those manufactured by the Hurlet and Campsie Company, Messrs. Monteith, Bramwell, and Tennants.

Ferrocyanide of potassium is another product much employed by calico-printers for the produc- tion of a blue colour with the proto salts of iron. This substance, which is commer- cially known as red prussiate of potash, is prepared by the transmis- sion of chlorine gas through a solu- tion of ordinary yellow prussiate of potash. On con- centrating these liquors they de- posit, on cooling, beautiful prismatic crystals of a ruby-red co- lour, and are composed (in 100 parts) of potassium, 36·14; iron, 16·87; car- bon, 21·68; and nitrogen, 25·31. Some fine specimens of this substance were comprised in the collection belong- ing to the Hurlet and Campsie Company; and a magnificent example in the case of the Messrs. Tennants, of Manchester, who also exhibited many other substances showing a great degree of perfection in the processes employed in their preparation.



FOUNTAIN.—THOMAS.

THE GREAT EXHIBITION TRADE MUSEUM.—Under the superintendence of Lieutenant Tyler and his assistants the whole of the large and interesting collection contributed to the Trades' Museum has been classed and arranged, and very shortly the entire will be removed to Kensington Palace, the whole suite of rooms in the first and second floor having been allotted for the temporary reception of the articles until some suitable building can be prepared. The articles are already so numerous, and the contributions so extensive, that it will require two or three weeks to convey them to their new destination. Each article will have its description appended to it, the country from whence it comes, its price, the quantity—whether raw material or manufactured article—that can be supplied, with any details of interest that may be obtained. Among the recent contributions is the model of Mr. Brunel's wrought-iron bridge over the Wye, at Chepstow, for the South Wales Railway, and we understand there are upwards of seven hundred firms and exhibitors who have contributions ready to send in, but who have been requested to retain them until some fitting place of reception is prepared.



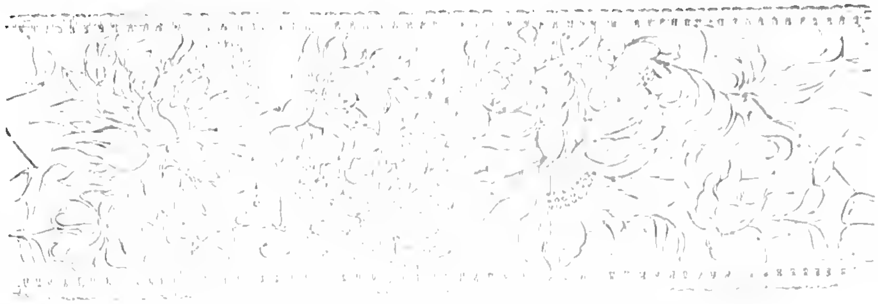
THE HALIFAX COURT.

CLOTHWORKIN first found a plac at Halifax in the com mencement of the fi teenth century, an aided by water comm nication with both Hu and Liverpool, it h risen rapidly since th introduction of th power-loom and the u of mixed fabrics.

The show of good from Halifax was n large, but it fair enough represented t industry of the town.

The leading featu of the display was i decorative charact the great proportion the goods being eith for furniture purpos such as damasks of va ous kinds, moreens, a table-covers, or intend for the South Americ markets, where gaie of colour and striki effects are in request an element of manuf ture. The contri tion of Mr. J. Wils of ponchos, mantu and shawls, best ill trated the peculiarit of this class of goo These contrasted in remarkable manner w those articles intend for our own dom tic purposes. Mess Hoadley and Pridi display, for instan showed this point v clearly. In these amples the patterns bold and effective, a generally in good tas the self-colours bei very excellent in d and finish.

Mr. W. Brown hibited some neat a effective patterns of t same class; the silk ho ever, was so sparin introduced as to give thinness of effect to t parts where it is se Messrs. Shepherd a Perfect also exhibit some good patterns worsted damasks; b the character of t table-covers is not p cisely what it might the designs being m clumsy than elega Mr. J. W. Ward's fur ture damasks, striped the warp, were ve superior in design a effect, and altoget his display was a tas ful one. In Mr. H. Mac Crea's expositi there were two or thr very excellent exampl of the furniture class,



RIBBON PATTERN, BY BERRY, COVENTRY.

The reputation of the Coventry ribbons is well supported by this firm, from amongst whose display we select a very pretty pattern.

o specimens for the uth American mar-t, of the usual effec-e character.

After looking at the y articles around, e contributions of essrs. Clay and Sons ruck, by the contrast ey afforded, being iefly jacket cloths r cricketers, ironing ankets, and blue nnels.

The display, too, of essrs. W. Barra-ough and Son was eculiar in its charac-r, being an assort-ent of druggetings, nseys, &c. The con-ibution of Messrs. ckroyd and Son, a neatly-arranged ame, showed the veral descriptions of arns used in the vari-us articles of manu-cture; carded and ombed twofold yarns, vo and threefold enappes, imitation enappes, genappe arp and weft, comb-d, fourfold combed, nd carded; embroid-ry yarn, and single nd double yarns, arded: and in finish-d fabrics they had amasks in the several nixtures of silk, cot-on, and wool, some f them exceedingly ich in colour, and esign; Orleans cloth, nerinoes, Cobourgs, amlets, serges, shal-ons, lastings, &c.; arious mixtures of lpaca, first introduced n the neighbouring own of Bradford, by Titus Salt, in 1835, when he bought a parcel which had lain ong on the importer's nands, and was be-inning to be thought iseless, though it is now so largely used hat the price has risen from 8*d.* and 9*d.* per lb. to 2*s.* 3*d.*, and even at times to 2*s.* 6*d.* and 2*s.* 8*d.* This firm are the largest pro-ducers in the town; and some idea may be formed of the extent of their operations from the fact that they pay 150,000*l.* in wages per annum.

Messrs. Aked and Sons showed another class of goods—pan-taloons, mixture coat-ings and fancy cheques; and these were excellent of their kind, in colour and quality.

Having thus briefly gone over the pro-ductions of this important district, we have to add that the examination of its various excellences, the important interests at stake in connexion with its wide-spread commercial connexion, the efforts made by the manufacturers of the West Riding to give full effect to the Great Exhibition by good and truthful examples of all they could do, demanded that every attention should be paid to the result of those efforts; and we are perfectly satisfied that no unprejudiced mind can have looked upon this display with anything but satisfaction, since, in spite of all sorts of sneers and innendoes about base imitations of superior goods, the deceptions practised in the manufacture of cloth—all too true in many instances in the ordinary course of trade—we have here such a proof of the capabilities of the manufacturers of this great district, as will tend to place them in an infinitely better position than they have ever held before in the estimation of those most interested in these productions.

SHAWL.—WEBBER AND HAIRS.

SHAWL.

WEBBER AND HAIRS.

We have, or fancy we have, a distinct recollection of this shawl, in the Central South Gallery of the Crystal Palace, and also, that it struck us as being a little *too* "striking" in respect of outline. The design is ingenious enough, and certainly bold, though making use only of acknowledged shawl decorative figures. The fault is that the pattern is not sufficiently interwoven; and that, in aiming after effect that most essential point in the intended "effect" of a shawl, comfort and repose, has been disregarded. In articles of dress the successful blending of colours should be the prime consideration; and as to pattern, for those of daily use, the less out-of-the-wayism the better.

SURGICAL INSTRUMENTS.

SURGICAL instruments might naturally be supposed to offer but little interest to the general public; yet the display exhibited, both by the British and foreign manufacturers, was so replete with curious contrivances, and on many accounts so remarkable, that we feel bound to give a short notice: and we venture to hope, that even the non-professional reader will be gratified with the account of some of the curious adaptations which have been devised to alleviate suffering or to cure disease. The time has long since passed away when the surgeon alone commanded respect for bold operations, and the medical man is now most esteemed who, by skill and judicious treatment, and who, by the power of thought and the use of the faculties of the brain, so treats his patient that the knife is unnecessary, and nature is assisted to work its own more natural cure. In this manner, hundreds of limbs which were formerly recklessly amputated, are now saved to the patient, and this class of operation is lessened by skill and judgment, to an extent which hardly admits of belief. Of late years, however, an extensive class of new operations has been introduced for the cure of deformities of various kinds: and though even here, perhaps, in future days the necessity for operating may be lessened, yet, while it exists, their performance confers a great boon to the patient.

First and foremost, we have to consider the orthopœdic operations for the cure of contracted limbs, club-feet, &c. These deformities are cured by a division of the tendons of certain contracted muscles, when, by mechanical contrivances, the limb is brought into its proper position. The after mechanical adaptations require much skill and knowledge on the part of the instrument-maker: and, after minutely inspecting the instruments exhibited, we are disposed in this matter to award the first place to Mr. Ferguson, of Smithfield, who has notoriously the largest business in this department of manufacture, and who has invented curious contrivances by which the club-foot is restored to its natural form, and by means of screws and springs the distorted member is compelled to assume its natural position.

The operations which are performed to remedy defects of vision, or to cure squinting, demand particular attention. The deformity of squinting detracts much from personal appearance, but surgeons have now an operation which very rarely fails in the hands of the skilful practitioner. It consists in the division of the muscle which draws the eye on one side, when the wound heals up, and the deformity is rectified. Other operations are performed on the eye to remove or heal up the crystalline lens, the opacity of which constitutes cataract; and again delicate operations are sometimes required for the purpose of forming an artificial aperture in the curtain or iris, when by disease it has become artificially closed. For all these purposes the most delicate and perfectly constructed instruments are required; and, in our judgment, the palm must be awarded in this case to our French neighbours: and we may even say that we are surprised at the excellence, ingenuity, perfection, and cheapness of the articles which they have exhibited. For ophthalmic instruments, perhaps M. Luer must be considered the first exhibitor; and when we mention that in our presence he took a cataract needle, bent it backwards and forwards, cut his nail with it, and then showed that it retained its cutting edge sufficiently well to cut a piece of leather, the surgeon may form an idea of the perfection of the manufacture. Whilst we are inclined, in ophthalmic instruments, to award the first place to M. Luer, yet the difference between him and M. Charrière in this matter is hardly appreciable; his ophthalmic instruments possess a very high order of merit.

There were exhibited by many manufacturers different specimens of trusses, and the practical surgeon knows that sometimes one is preferred, sometimes the other, according to the particular case which has to be treated; but we have now to call attention to that which has lately been devised by Dr. Arnott. We have, on many occasions, had to notice the obligations which the profession and the public owe to the ingenuity of this distinguished philosopher, and perhaps in no respect is he entitled to his well-deserved reputation more than in this invention, the particulars of which he has not even, as yet, published. The truss itself is so contrived that it can be made of any strength in the spring, the form of the spring can be regulated to the greatest nicety, and the pad can be set to any inclination to the spring and there fixed. By this excellent device, some of the worst forms of disease can be effectively reduced, and by this contrivance a desideratum long required has been efficiently supplied. To the honour of the medical profession, and the credit of the true philosopher, this invention, like all his former ones, Dr. Arnott has given to the public without reward, and hence any mechanic may make it, either for his own use or for sale.

In Mr. Ferguson's case were also shown instruments adapted to support the patient in cases of lateral or posterior spinal curvature. Such contrivances are, undoubtedly, occasionally required; but the majority of these deformities, especially in the slighter cases of females, are owing to the improper use of stays, which are so contrived as especially to favour this production; and, in fact, the majority of these abominations shown in the Crystal Palace may be viewed rather as articles to be avoided than to be commended. Every mother should know that the female form is never developed in all the beauty of nature if it is permitted to be impertinently meddled with by art, and hence the Chinese shoe or Indian compress are no whit more barbarous than the English stays. The one destroys the foot, the second completely alters the shape of the head, and the last contorts the chest and forms a lateral curvature in the back: so that, whilst we may send out schoolmasters to civilise the Chinese and Indians, they, in return, may send to this country teachers to rectify English notions.

Whilst upon deformities, we should notice the artificial legs and arms in the South-east Gallery, which are employed in the Austrian army after amputation has been required. They were shown for the economy of their manufacture, and are certainly vastly superior to the wooden pegs and hooks used in this country. Artificial noses were shown, which wonderfully hide the injury to the countenance caused by a loss of that organ; and artificial eyes were contributed by Grossmith, and in this department the French were also exhibitors, in the person of M. Boissonneau. Artificial eyes are used to correct the deformity which is produced by a collapsed globe; and so perfectly can they be adapted to imitate the other eye, that it is with difficulty that the one can be recognised from the other. Glass eyes are made of a very fusible enamel, which partially dissolve by the tears, and hence require to be renewed once a year or year and a half. We do not know whether any of those exhibited were so made as to obviate this very serious inconvenience.

Amongst the instruments, stethescopes were shown in many varieties. By the stethescope, the physician ascertains what is going on within his patient's chest: he hears the air enter and emerge from the lungs; he listens to the action of the valves of the heart, and ascertains whether any deviation from a healthy function is occurring. The stethescopes made by the Gutta Percha Company are perhaps the best which modern science has afforded. For ourselves, however, with certain exceptions, we greatly prefer the ear alone, unaided by foreign contrivances.

Amongst other contrivances for distinguishing disease, the instrument devised by Mr. Avery, which was shown by Mr. Weiss, well deserves attention. By the use of a speculum and lamp, he is enabled so to illuminate cavities in the body as to be able to see in situations where hitherto it has been thought impossible to obtain a view of the parts. We happen to know that Mr. Avery has laboured for years to bring his invention to its present perfection, and he must now be congratulated for his success.

We also remarked Mr. Alfred Smee's optometer, for accurately determining the optical properties of the eye: which is of important service in discriminating the numerous diseases of defective adjustment and impaired sight.

Tourniquets, or instruments for arresting the flow of blood, were shown in many varieties. Of late years, attempts have been made so to construct these instruments, that, whilst they press upon the artery and prevent the flow of blood into the limb, they do not compress the veins and prevent its return. The instrument devised by Mr. Skey, jun., is well adapted for this purpose, and was shown in the interesting collection of instruments exhibited by Mr. Ferguson. Mr. Ferguson also showed chloroform inhalers; but many surgeons now simply place a small quantity of that fluid upon a handkerchief. At St. Bartholomew's Hospital chloroform has been almost invariably adopted since its discovery, and, we believe, has not been in any one case attended with any unpleasant result. Nevertheless, at other places accidents have occurred from its use: so that this great discovery cannot altogether be said to be free from danger. Mr. Hooper made the first in London, and sent some to our office. We tried its effects upon some rabbits, and lost one or two, from which we stated, that we feared, that, without great care, untoward results might possibly occur. Extended experience has shown that by proper care and skilful management, the discovery of the properties of chloroform has conferred a great boon on mankind, by allowing the surgeon to convert, for a time, the conscious man into an insensible body, and by enabling him, in that state, to conduct his operations attended with as little pain as though the patient were a lifeless stone or inert log of wood.

The French instrument-makers are greatly distinguished for their ingenuity; but, really many of their contrivances are mere useless toys. Nevertheless, other devices deserve high commendation. They have an instrument for removing pieces of catheter, which is so devised, that whether caught transversely, or in any other position, it swings round into the horizontal form, and is driven out by its long axis. By this device an operation may be sometimes prevented, as an obstruction may be extracted by its means, which could only otherwise be removed by the

nife. The apparatus for removing the tonsils is very simple: we believe hat they are much cheaper than those made by our instrument makers. There are several varieties of trepanning apparatus amongst the French nstruments which deserve attention, though in civil service this is an peration which is but seldom employed.

Dr. James Arnott showed contrivances for obtaining a loss of feeling by tense cold, and also means for keeping a constant stream of water of any iven temperature against any part of the body. By the application of eat and cold vast results may be produced; and it is said that operations ay be performed without pain upon parts benumbed with intense old.

Amongst the surgical instruments were placed a series of Daguerréo- ype drawings by Dr. Badcock, of cases illustrating that the small-pox rus may be inserted in the cow, and gives rise to pustules, which again ay produce in man the cow-pox. He states that his experiments have een conducted in 8000 cases; and hence it follows, that if the small pox hould break out in any part of the world, there is no occasion to wait for mph from distant countries, but medical men have means at command f producing from the patients that which is competent to protect others. he discovery of Jenner is certainly one as remarkable as any in medical istory.

There were several varieties of transfusion apparatus shown by different akers. Occasionally, when a person is suffering from the last stage of inting from loss of blood, the abstraction of blood from one person and jection into the patient has sufficed to restore life. We have seen two r three instances where such an operation has been perfectly successful, nd yet it should never be performed except in extreme cases. Upon the hole, perhaps, the best instrument was that exhibited by Fergusson, with e double receiver, devised by Dr. Goodfellow, to hold the blood, and at e same time to keep it warm to prevent its coagulation.

A number of specimens of oil-silk and other transparent membranes were hown for the treatment of incised and open wounds. The art of surgery as in no direction more advanced than in the treatment of these cases; and any instances, which used formerly to be covered with heavy masses of oultice, which irritated and caused much discharge, are now treated much ore elegantly and simply by a piece of lint and a covering of either oil- lk or gutta percha. This line of treatment is not only one which affords uch comfort to the patient, but the progress of the cure is much facilitated nd the recovery is more rapid when this plan is adopted.

The various instruments necessary for removing calculi were shown. It as hoped that by crushing the stone the operation for lithotomy ight often be dispensed with. Nevertheless, notwithstanding the great nprovements in the instruments, the latter operation is found too irritating many cases, and the surgeon has now more frequently to perform the peration for lithotomy than was originally anticipated when the new process ame into use. The French lithotrites are remarkable for their cheapness. we believe that they are sold at a much lower rate than those which are anufactured by English workmen. Mr. Wakley's instruments for dilatation ere shown by two or three exhibitors. They consist of a series of tubes, ach of which slips in succession over the other. Mr. James Arnott also howed his pneumatic dilator, but it has not met with very extensive pplication.

Cutting instruments, such as scalpels, bistouries, saws, scissors, were shown every conceivable form to meet various cases. Every form of surgical eedle was shown, including those more complex contrivances for sewing in avities far removed from the surface.

With regard to splints, many were exhibited in various parts of the uilding, adapted for various fractures. When the upper part of the thigh broken, the surgeon experiences much difficulty in keeping the bones in heir exact place, and hence many contrivances have been made for that urpose. We were much pleased with the registered leather splint for actures of the tibia and fibula, having used a somewhat similar contrivance urselves with great success. The use of gutta-percha, which Mr. Smee as brought into notice, for fractures and diseased joints, did not appear to e sufficiently illustrated, though we observed a gutta-percha splint in the ndian collection. In our own practice we rarely use anything but moulded utta-percha splints, and, upon the whole, we believe that this material, if ghtly used, is better adapted for splints than any other substance.

There were various artificial leeches shown, but the natural leech is robably preferable for taking blood to any contrivance which can be made. upping instruments, as a matter of course, were exhibited; and the French xhibited a contrivance for drawing the milk by means of a vacuum, with contrivance that the child may draw it through another tube at the same me. We have no practical experience of the efficacy of this invention, ut, where necessary, it might be subjected to the test of experience.

There were several specimens of Hutchinson's spirometers, instruments sed for determining the amount of air which is inspired and expired. Our resent means of ascertaining the state of the chest by auscultation, per- ussion, and by observing the amount of expansion, are really almost ample r the purpose of distinguishing disease. At some of the insurance offices is instrument is employed; but a glass-blower or other person accustomed the use of his lungs invariably shows a capacity of lungs which is far too reat for his height and bulk. Without positively stating that in no instance may be useful, we may state that it is far from being an universally pplicable instrument for the surgeon.

The dentists exhibited numerous specimens of their art. We hardly are sposed to consider the relative merits of the rival exhibitors, but the contest appears to lie between those who make their teeth of the tusk of the hippopotamus, and those who rely upon a particularly hard enamel constructed for the purpose. In the adaptation of artificial masticatine apparatus it is necessary that they should be constructed with the greatest nicety; and perhaps the best apparatus which has yet been devised is that which has been patented by Mr Tomes, and which has already received the medal from the Society of Arts. This machine, which is very curious, Mr. Tomes neglected to send to the Exhibition—an omission which, in our judgment, he should not have been guilty of, as it is the most interesting addition to the mechanism recognised by the scientific dentist which has been devised of modern years. In the South-west gallery, those who delight in the grotesque were much amused by sets of artificial teeth kept in motion by mechanical contrivances.

Mr. Weiss exhibited a complete surgeon's cabinet, and his instruments, especially his forceps and lithotrites, were of the highest finish. Mr Evans and Mr. Savigny are greatly celebrated for their cutting instruments, and, from our own experience, we must say that this latter firm are famous for the quality and temper of their knives, and, perhaps, upon the whole, we prefer their instruments of this class. Mr. Simpson contributed a limited display of good instruments. Mr. Ferguson's case contained by far the most extensive variety of instruments, and for all the orthopædic instruments, he must be considered to hold the first place. For minute contrivances and complicated instruments, M. Charièrre and M. Luer bear the palm; so that, in point of fact, whilst all are excellent, each of the firms is distinguished for some point, and all have maintained their high reputation in the different articles which they have shown.

HARDWARE.

(Continued from page 304.)

WE return once more to a consideration of the various objects of native production in iron and general hardware, Classes XXI. and XXII. These classes comprehend a very extensive series of manufactured articles. The range between a delicate bead needle and the huge Admiralty anchor is a wide one, but in the Exhibition it was well filled in, and admits of division into many important groups. The metal manufacture is, to such a mineral-producing country as England, a study of the utmost importance, and to examine it aright, under the favourable circumstances of the Great Exhibition, it should have been commenced in Class I. The character of the iron obtained from different kinds of ore was there shown, and many examples of finished manufacture associated with them. In the collection of Messrs. Bird and Company, some very remarkable examples of manufactured iron were shown; and the Ebbw Vale Company, Messrs. Beecroft & Co., and some others, showed the peculiar molecular arrangement of iron bars of different descriptions, with a view to the determination of the quality of the bar for any use to which it may be applied.

With iron, as a metal, every one is familiar—there is no natural production which has been so extensively employed for the use of man as this mineral. Yet we are almost entirely ignorant of some of its most remarkable properties. Very slight causes, which cannot be easily determined, give rise to a fibrous or crystalline condition. It has been stated that vibration merely will produce the change; and that railway axles have been known to break, from the circumstance of their undergoing this change in the structural arrangement of their particles. Some experiments made by engineers have not, however, confirmed this statement, and the probability is that the crystalline structure is generally induced in the process of cooling, but it is certain that repeated hammering will effect the change in question.

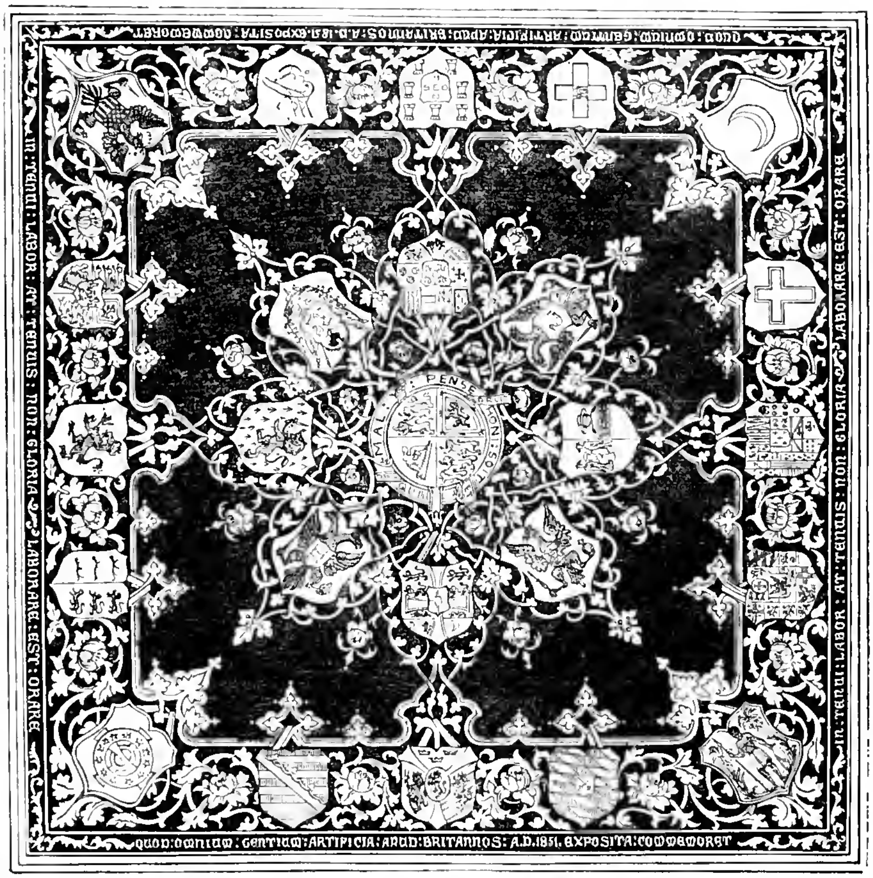
Mr. Morris Stirling has patented a process by which he associates wrought with cast iron, and alloys iron with other metals; thus, according to his statement, producing a much tougher metal than that which is ordinarily employed. A rail broken, to show the structure of the bar, exhibited the fibrous or toughened top in cohesion with a crystalline centre and fully illustrated these two conditions. Many metallic alloys were exhibited with the other illustrations of the patent processes of Mr. Stirling and in the central avenue was a bell of very remarkable tone, which showed, by its musical note, the perfection of its molecular composition, this being one of the patent alloys. M. Savart has shown that the natural note of any sonorous body depends upon the arrangement of its particles, and he has proposed to adopt this as a test for determining the actions of the molecular forces, and changes of structure which cannot be in any other way detected.

Sheet iron of various kinds was exhibited, both black, tinned and "galvanised;" but when we passed to an examination of the Russian sheet iron, a remarkable difference was found in its favour. Our sheets are rough—even the best are not true surfaces; whereas the Russian presents a most

uniform texture, and the utmost smoothness of face. The coating with zinc, which is effected in several ways, forming the galvanised iron of the market, is valuable as protecting that metal—the exterior coating of zinc oxidising, and forming a crust through which atmospheric influences cannot act. Berlin has long been celebrated for its iron casting, a large proportion of the population of that city being engaged in the production of ornamental works in iron. When, however, the gates of the Coalbrook Dale Company, those of Cottam and Hallen, and the rustic dome of the former company are considered, it must be evident that we have the ability to produce castings of equal beauty to those of Berlin. Great stress has been laid upon the character of the iron ore employed, and the circumstance that the Berlin works are manufactured from bog iron ore has been seized upon in explanation of their fine character. But the "Eagle Slayer," and the small statuettes, both black and bronzed—and, in addition to these, the numerous and very beautiful castings from other works—prove that the English iron-founder can produce articles in iron possessing as high a degree of elegance and sharpness as any which the foundries of Berlin can supply.

STAMPED BRASS CORNICE.—WINFIELD AND CO.

We have in a former article spoken of the variety and beauty of the metal work on the grates and stoves. The brass furniture in the Exhibition was of a striking character, but we are not satisfied with the increasing practice of overlaying all these things with an excess of ornament, and of disguising the purpose of the articles. Lamps intended for gas are made to represent oil-lamps, and candlesticks are tortured into shapes which were certainly never designed to carry either wax or tallow. Good taste indicates that the utmost beauty should be given to the form of even the most ordinary utensil, but that its object should never be disguised. In manufactures every thing should be what it seems. We have heard objections raised to the combination of glass and parian with metal. We see no objection to this where the parts of the whole design are made to blend in harmony, and where the combined result is at once indicated. Much of the pressed brass is exceedingly good, and the manufacture of brass furniture by Messrs. Winfield & Co. appears to have been carried to a point of superior excellence.



HERALDIC TABLE-COVER, ARMS OF ALL NATIONS,—UNDERWOOD.

The bays devoted to the manufacture of Birmingham and Sheffield were remarkable exemplifications of the varieties of metal manufacture in those marts of industry. The brass, or-molu, Britannia metal, and German silver, which are worked into a thousand different forms of use and ornament, together with the illustrations of button manufacture, sufficiently distinguished the division allotted to Birmingham—whilst penknives and pruning-hooks, scissors and scythes, swords and saws, clearly determined where the industry of that town is located which from the days of the Saxons has been celebrated for its cutlery. Many of the examples here displayed were of a most extraordinary kind. They at once showed the facilities of the manufactories of Sheffield for producing every variety of steel goods, and the zeal with which the workmen and the manufacturers had entered on the task of producing the best specimens of their work fo the Exhibition. Sheffield plate, much of which was exhibited i Class XXIII., as distinguished from electroplating, also marks a peculia branch of industry. In th first, the silver and coppe are, by means of a furnac fire and a flux, united; and th compound cake is then brough under rollers and extended. Silver, being much more ductil than copper, is capable of muc greater extension; and it is prac ticable, consequently, to sprea a very thin layer, in this way, ove a very large surface of copper.

Much of the plated metal no in the market owes its silver t the chemical decomposition a salt of silver in solution—th being effected by voltaic agen —so that the revived metal precipitated in an adhering an very uniform coating over eve exposed surface. The electroty and electro-plating processes are to be reckoned among the most valuab of the modern applications of science.

The cutlery and hardware of many of the foreign departments merited t utmost attention. In the French department were examples of castings a other modes of production in iron, brass, bronze, and zinc. Austria was a lar contributor of every va ety of metal manufactu —almost every part of t empire producing eith metal goods or the m talliferous minerals. B hemia, Moravia, Styr the Tyrol, Carniola, a Carinthia, sent specime of their native produ and of their manuf tures. Among the markable points of t Austrian metal manuf ture are the Milan ste as it is usually calle and lead pipes. One ample—a pressed lead pipe, 900 feet long in o piece—was shown, a they can be made of equ thinness and fineness any length. The exte of the steel manufacto may be judged of fro the fact that the 142 st works of Austria furni annually about sev million of scythes, s kles, and straw-cutte The Zollverein had al an extensive and int esting exhibition of se ral branches of the bour bestowed on met manufacture. Nass sent her iron ores in co siderable variety, as w as manufactured iro The United States a yet young as a metal-pr ducing country. No withstanding their exte sive supplies of iron o most of the iron they e ploy, and all the steel, imported from Englan

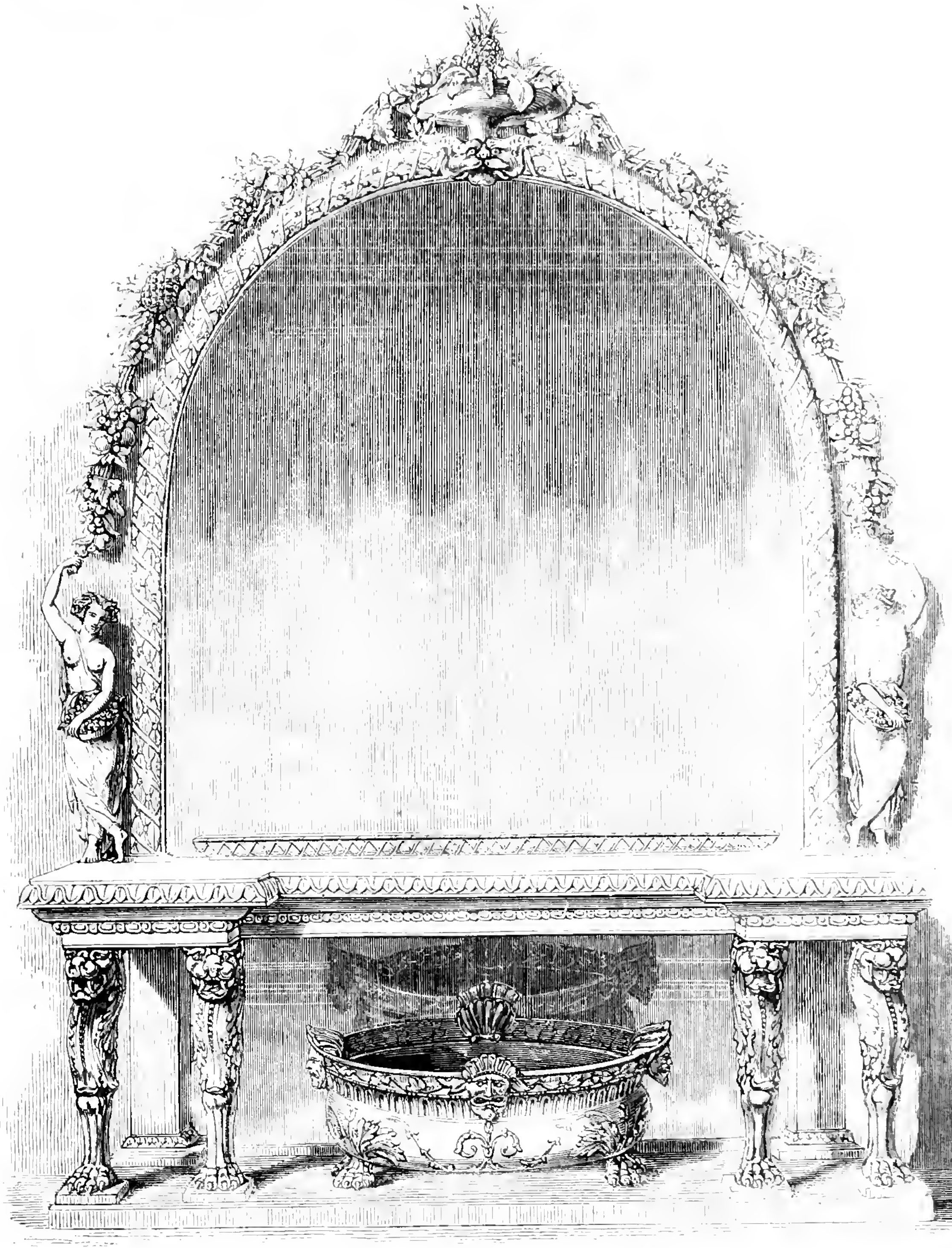
HERALDIC TABLE-COVER. BY UNDERWOOD.

The Heraldic Table-Cover, by Underwood, of Oxford-street, is a remarkabl handsome specimen of British taste and skill, and is intended to comm morate the Great Exhibition of 1851. In the centre are the arms of t British Empire, and around are those of the principal nations of the glob On the extreme edge are suitable inscriptions, as:—

"In tenui labor et tenuis non gloria" (The labour has been expended on a slight pr duction, but the glory will not be trifling.) "Laborare est orare" (To work is to worship "Quod omnium gentium artificia apud Britannos, A.D. 1851, exposita commemoret" (T commemorate the workmanship of all nations held in Great Britain, A.D. 1851.)

We understand that no less than 223 blocks and copper-plates have bee used in printing this table-cover, which is two yards square.

The
CRYSTAL PALACE
AND ITS CONTENTS.
AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.



SIDEBOARD.—MESSRS. SNELL.—(SEE PAGE 396.)

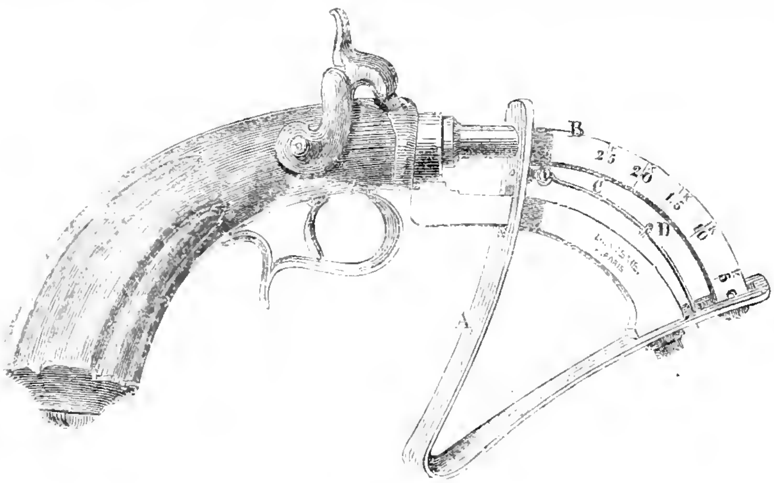
ARMS AND ARMOUR.

GUNS.

AMONG the guns exhibited, one case from Birmingham presented an epitome of the trade. First was a common flint musket with a stained beech stock, sold wholesale for about a dozen shillings, for the African trade, and a much better article than what used to be made in the old slave-trade days, when a gun was the price for a man; still, although warranted, the African musket is of low manufacture. By steps, improvements and ornaments are introduced, until we are led from the plain double gun for the American market to the best article that Birmingham can produce, elaborately ornamented.

Some of the guns were 400*l.* each; and the low-priced 5*s.* 6*d.* A very instructive collection was exhibited by Mr. H. Hart, showing the complete manufacture of gun-barrels, from the old horse-shoe stubs of the earliest periods, to the latest improvements.

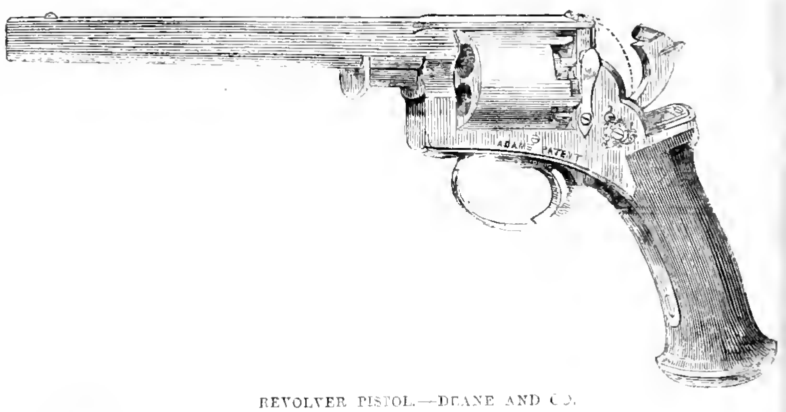
In the collection of Messrs. Tipping & Co. there was a complete collection of iron and steel in various combinations, for being ultimately welded into gun-barrels. The metal was shown formed into a "bloom," welded into a rod, rolled into a flat bar, coiled round a mandril like a ribbon, then welded into a barrel, ground, filed, and finally finished. All the separate parts of a gun, showing the vast number of pieces that go to make up the whole, were also to be seen.



PROVING PISTOL.—DEVISME.

Colonel Peter Hawker not only sent a famous Stanchion gun, which loads at the breech, and balances so nicely that a finger touch is sufficient to adjust the aim; but a very neat model of an improved punt, for wild-duck shooting. Colonel Hawker also exhibited "a new double gun for 1851," the novelty of which is the self adjusting primers, without cover or spring, that will not only defy wet weather, but also the saline atmosphere in sea-coast service—in which he has proved the failure of all copper-caps and fine powder. This new gun has conical breechings that will admit, when required—as in wet weather, or at sea—the use of the largest grain cannon powder.

There were not exhibited many remarkable novelties, the chief merit consisting in excellence of workmanship and high finish. Messrs. Manton and Son, of Dover-street, were exhibitors of several of their celebrated double-barrels, most beautifully finished. Messrs. Westley, Richards, and Son, of Birmingham, exhibited specimens of rifles and "double tiger guns." Nearly all the best makers, indeed, sent contributions in some form or other. Among the novelties, may be noticed the protector against wet, invented by Mr. Gibbs, of Bristol, which consists of a small India-rubber cover that fits over the nipple of the gun, and prevents any wet from getting to the powder. Mr. Needham, of Piccadilly, showed several peculiarities in the form of self-priming muskets, self-loading carbines, and guns to load at the breech. Mr. Beckwith, of Snow-hill, exhibited some blunderbuses, with six radiating barrels. Erskine's newly-invented waterproof and safety gun (also exhibited) provides, in one action, against

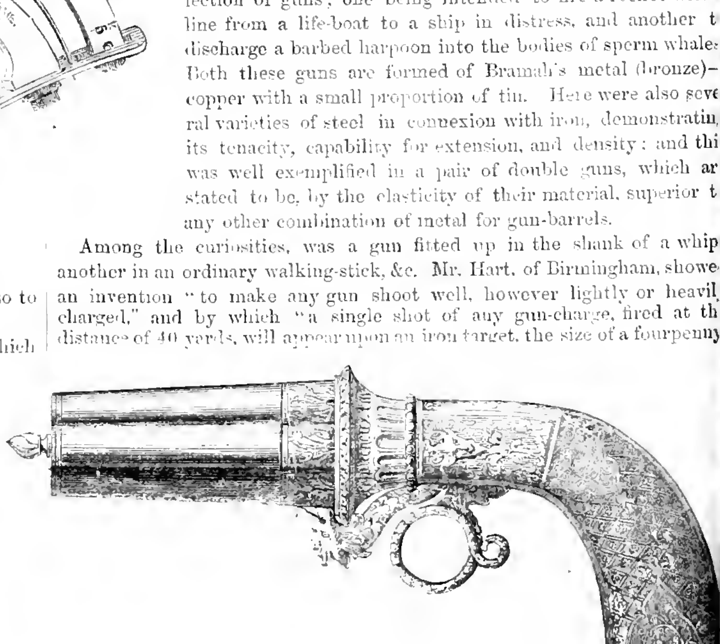


REVOLVER PISTOL.—DEANE AND CO.

the percussion-cap being prevented from exploding by exposure to the rain, and also prevents the accidental discharge of the gun by the hammer falling. This is effected in a very simple manner. A metal shield, containing a ring of India-rubber, encloses the cap completely, so as to keep out all damp; and at the same time, prevent the hammer striking the cap, should it fall accidentally. The instant the gun is brought to the shoulder, for the purpose of firing, a spring in the butt of the gun, by the mere pressure against the shoulder, releases the shield, which flies up, and leaves the cap free for the action of the hammer.

Mr. Greener, of Birmingham, exhibited a numerous collection of guns; one being intended to fire a rocket with line from a life-boat to a ship in distress, and another to discharge a barbed harpoon into the bodies of sperm whales. Both these guns are formed of Bramah's metal (bronze)—copper with a small proportion of tin. Here were also several varieties of steel in connexion with iron, demonstrating its tenacity, capability for extension, and density: and this was well exemplified in a pair of double guns, which are stated to be, by the elasticity of their material, superior to any other combination of metal for gun-barrels.

Among the curiosities, was a gun fitted up in the shank of a whip another in an ordinary walking-stick, &c. Mr. Hart, of Birmingham, showed an invention "to make any gun shoot well, however lightly or heavily charged," and by which "a single shot of any gun-charge, fired at the distance of 40 yards, will appear upon an iron target, the size of a fourpenny piece: or, in its progress, a single corn of shot will go through a penny. Mr. Goddard showed first-class fowling-pieces—an American duck gun, an East Indian Company's pattern musket, an African musket; and a "Californian Protector," from which are fired sugar-loaf balls, which kill at near 800 yards' distance.



FIVE-BARRELLED PISTOL.—LEFAUCHEUX.

FOREIGN GUNS, &c.

GUNS.—The north side of the Exhibition presented more novelties in fire arms than the British. The method of loading at the breech, which is scarcely introduced in England, has been for some time common on the Continent: several specimens of this kind were exhibited. The greater rapidity of loading, by using rifle barrels, has led to their being introduced in several Prussian regiments: it is stated that the heavy Prussian rifle, with a conical shot, has an effective range of 1000 yards. Prussia also exhibited some highly ornamented and well-finished guns and pistols. France exhibited several cases of guns and pistols. M. Flobert carries the plan of loading at the breech into operation in a very novel manner: he uses a small cartridge made of percussion powder alone, the ball is fixed to the end of the cap, and is introduced at the breech by the doubling down of the barrel; and the blow of the lock explodes the percussion powder, which propels the ball without the addition of gunpowder. It is stated that a pistol-ball may be made effective in this manner at 100 yards, and that a rifle will double that range. In the Prussian Zund-adel-gewehr, or needle gun, loading by the breech is effected by the cartridge, on one end of which is stuck a patch of detonating powder, which becomes exploded by the rapid darting forward of a needle, whence the appellation *Burn-needle Gun* is derived. The Belgians displayed here guns and pistols of all kinds, to suit various nations — European, African, Asiatic, and American —from the small-bored, long-barrelled gun, with short stock, used by the turbulent hordes of North Africa, to the delicacies of breech-loading rifles and revolving pistols.

Colt's revolvers in the American department excited considerable interest. The great difference between these revolvers, or "Patent Repeating Pistols," and the revolvers made in this country, is, that our pistol has a barrel for every shot; while the "Repeater" has but one barrel, and a six-chambered revolving cylinder for the reception of the charges. The hammer is placed behind the cylinder, sufficiently low to form, by the help of a groove in the fore-part, when cocked, a back sight. When half-cocked, the cylinder rotates freely on the base-pin, so as to bring in turn all the chambers in a position to receive their charge. When cocked, the cylinder is fixed ready for a discharge, by pulling the trigger; and re-cocking produces like results, till all the chambers are discharged. In loading, balls of soft lead, without wadding or patch, are placed upon the mouths of the chambers, turned under the rammer and forced home by the lever—so completely filling the chambers, as to preserve the powder in a condition for firing, even after completely immersing the arm in water. Colt's Holster Pistol projects a ball 1200 yards; and, during some trials at Woolwich, at a distance of fifty yards, the whole six shots repeatedly struck the target within a circle of six inches radius from the centre of the bull's-eye. Again, when the hammer is down, it rests between two of the pillars, which prevents the breech from turning, and secures it from accident.

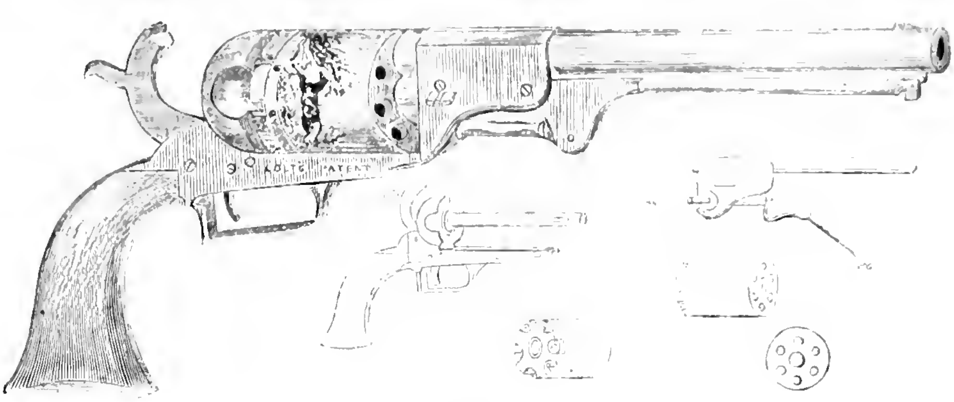
RIFLES.—Specimens of rifle-barrels in every stage of finish, were sent by several exhibitors, to show the mode of making the twist. Amongst the most recent improvements, was Mr. Lancaster's "Elliptic smooth bore, twisted, or spirally inclined." Manton and Sons sent a double rifle; and Wilton and Daw a Two-ounce Rifle "for India and Africa."

Telescopes were fixed on many of the rifles, with cross hair in them, to assist the shooter in taking aim. From Prussia were exhibited a Rifle loading at the breech, by Shaller, of Seeld; a Rifle with seven barrels, all to be fired at once with needles; and a Belgian Rifle, in which the charge is placed in a cylinder, which revolves in the breech, the lock being cocked at the same time; it is fired by a needle.

L. Sauerbey, of Gotha, contributed a Double Rifle of solid cast-steel; the barrels bored in a converging direction, so as to aim at the object with both balls. And L. Tentenberg, of Heiter, showed a "Rifle with Seven Barrels," for wild-fowl shooting; in which all the barrels can be fired and loaded at once.

Revolving Guns and Pistols were exhibited both in the English and Foreign collection; with from 6 to 21 barrels, which revolve, and bring each barrel in turn under the hammer of the lock; or they have one barrel, surrounded by several revolving chambers, which are fired like the barrels. Revolving Barrels were shown in great numbers: one from France had a dagger projecting between the screws; there was also an American Self-cocking and Repeating 10-barrel Pistol, and a Belgian 21-barrel; each adjusted by pulling the trigger. An English Revolving Hammer, with six barrels, was likewise shown.

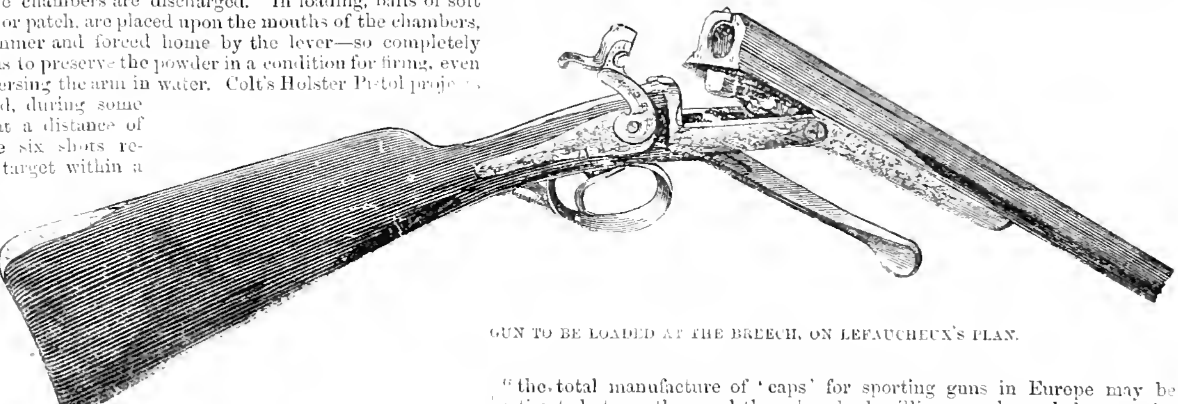
ORDNANCE. IRON GUNS AND MORTARS. Among the English specimens, were two noble guns from the Low Moor Iron Works; one a 32-pounder, and the other for 10-inch Shells, mounted on Improved Carriages and Slides. The Belgian Government exhibited six Guns and Howitzers, and a Mortar, cast at Liege, rough as from the mould, the cast iron prepared with coke and wood; one of these guns, reported to have stood 6000 rounds; and another, 2118 rounds, with its vent scarcely injured. From Prussia was shown a Field Gun, of forged cast-steel. There were also a Wrought-iron Howitzer and Mortar from Spain; Turkish Guns, sixteen with gold touch-holes, and superbly inlaid; an Indian Iron Field Gun upon a curious carriage; besides Camel Guns on Pivots, or fixed to the saddle-bows. A Brass Howitzer, 9 inches bore, was shown from the Royal Foundry at Seville.



COLT'S REVOLVER.

Among the *Shells* exhibited was one of the monster Paixhain Mortar, used at the siege of Antwerp, and one of whose shells made "a hole large enough to bury two horses."

PERCUSSION CAPS.—The French and Belgians sent specimens, but neither will resist damp or fire so certainly as the English; and it may be questioned if the Austrians equal the French. Sellier and Beliot, of Prague, furnished a handsome specimen of their Percussion Caps, and stated that "the total manufacture of 'caps' for sporting guns in Europe may be estimated at one thousand three hundred millions yearly, and the quantity of copper requisite for its production is 396,000lb. weight."



GUN TO BE LOADED AT THE BREECH, ON LEFAUCHEUX'S PLAN.

Among the best English Caps were those exhibited by Walker and Joyce.

REVOLVING PISTOL.—BY DEANE AND CO.

THE revolving pistol patented by Mr. Adams, of King William-street, of the firm of Deane, Adams, and Deane (of which we have affixed an Illustration), has been found on various trials, to possess many advantages, and has elicited the unanimous approval of the officers of the army and navy, some of whom, with several noblemen and gentlemen, attended at Enfield and Woolwich to witness its powers. The advantages it appears to possess are simplicity of construction, lightness, rapidity of loading and firing (at least ten discharges per minute), that it never misses fire, cannot easily get out of order, and does not clog up by use. It cocks and fires with one action on the trigger.

DEVISME'S PROVING PISTOL.

DEVISME'S proving pistol, for trying the strength of gunpowder, is constructed upon a very simple principle, and is said to answer the purpose with extreme accuracy. The charge is inserted in a small tube or barrel drilled in the stock, and which it fills. Against this the flat surface of a steel spring presses; and, upon the charge being fired, the extent of the divergence of the latter along the graduated scale indicates the degree of strength of the powder proved.

FOREIGN AND COLONIAL DEPARTMENTS.

DENMARK.

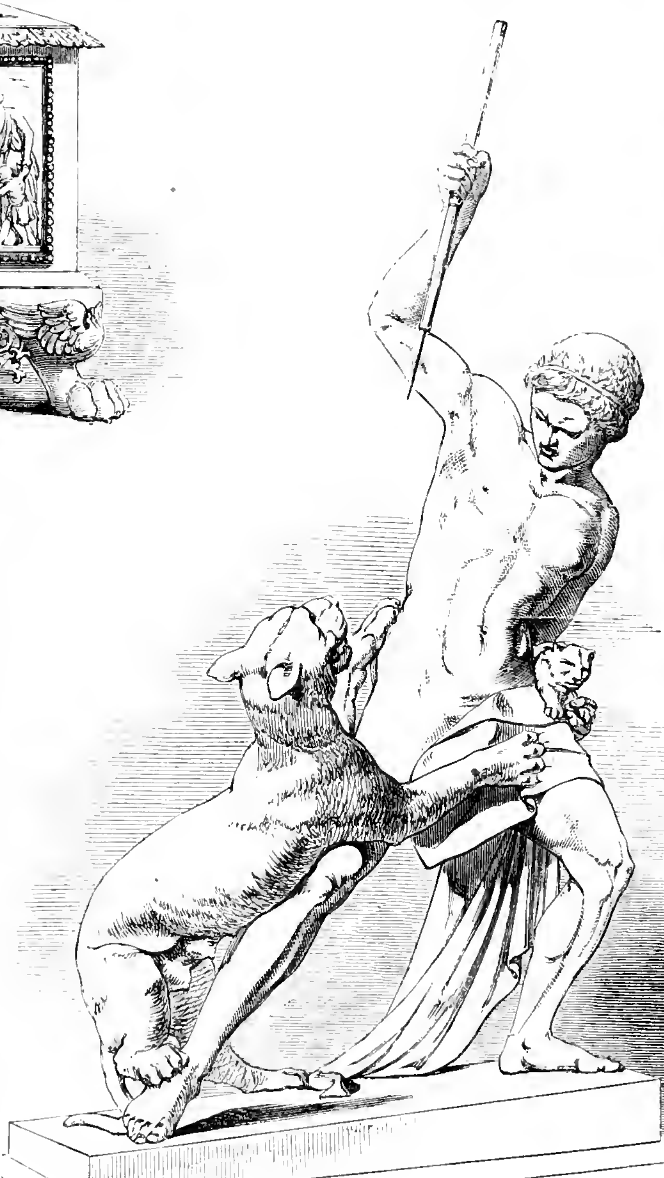
ABOUT forty-seven exhibitors represented this country in the Exhibition. The articles exhibited illustrated several of the Classes, and included

IVORY CASKET, FROM DENMARK.

raw produce, machines, manufactures, and fine arts. Among the machinery, were a pump applicable also as a fire-engine, a steam-whistle also serving as a water-gauge for steam-boilers, a type-composing machine, and a chaff-cutting machine. Among philosophical instruments were several clocks and watches, inclusive of an astronomical clock of accurate construction with a new escapement. There was also some apparatus for philosophical experiments, and several surgical instruments. Several nautical compasses, balanced by a new method, were exhibited. Interest was also attached to a specimen of mechanical ingenuity and patience in the form of a file elaborately made, and containing a number of small files and rasps within it. In the ceramic art two very different classes of objects were shown, but both of equal interest, though of greatly dissimilar value; of these, the first are specimens of the black crockery of the Jutland peasantry, made at their own homes, and 'glazed' by being smoked so thoroughly as to render them impervious to water. The other were the productions of the Copenhagen Royal Porcelain Manufactory, consisting of vases, figures, &c., in a high style of art. One of the most interesting articles in this collection, to those concerned in the applications of the discoveries of philosophy to the requirements of mechanism, was to be found in the electro-magnetic engine exhibited by a native of this country. This engine illustrates the practical application of the electric current to the development of mechanical force through the induced magnetism of certain masses of soft iron. A considerable length of stroke has been gained in the machine, and the principal remaining problem, for its practical employment to the purposes of a prime mover, is the discovery of an inexpensive and continuous source of the electric current. When this can be found, if it may be considered possible, then electro-magnetic engines will to a great extent supersede those moved by steam and other powers.

SWEDEN AND NORWAY.

THE universal reputation of Sweden for its iron and steel, rendered the specimens exhibited in support of its celebrity the more valuable and attractive. As many as thirty of the exhibitors of these countries sent specimens of iron and steel, either in a raw or in a manufactured state. One of the causes of the superiority of the Swedish iron for conversion into steel appears to be this—that the ore employed is the magnetic iron ore. But an equally important cause unquestionably lies in the fact, that mineral fuel is not employed in the process of smelting, the fuel used being charcoal or wood, or both. Carbon is thus supplied to the iron in a form much more pure, and possibly much more readily capable of entering into chemical combination than in its state as coke or coal. The production of iron being of great importance to the prosperity of the country, it has been the subject of various public enactments, and is carried on under the direct superintendence and sanction of a Central Board. Licences to manufacture certain quantities of iron annually are granted, and every furnace and iron forge pays an annual duty to the crown. The amount permitted to be manufactured is regulated according to the means of the iron master to obtain the requisite supply of charcoal without public detriment or inconvenience from its consumption. The annual amount of iron made in Sweden is about 90,000 tons, of which about 70,000 are exported. A good collection of ores from Christinehamn and Boforss was exhibited. It included also specimens of steel and of toughened iron. Other exhibitors showed specimens indicative of the extreme toughness and resistance to fracture communicated to their iron. There was also a large collection of cutlery. Of the



THE HUNTER AND TIGRESS.—JERICHAU, OF DENMARK.

textile manufactures, were exhibited specimens of flax, silk, and woollen fabrics and materials. Some models of flowers in wax were also interesting. Specimens of native silver from the mines at Kongsberg, in Norway, indicated the possession of an available source of this valuable metal. Chrome

iron ores and a chemical product from them, bichromate of potash, were exhibited. Interest was also excited by some of the homely domestic productions of the Swedish and Norwegian peasantry, whose long winter nights give time for such occupation, and preclude out-of-door work for more than a few hours. A magnificent vase placed in the centre avenue, a large cannon, and specimens of ornamental furniture, &c., also attracted much attention.

WORK TABLE, FROM HAMBURGH.

THE NETHERLANDS.

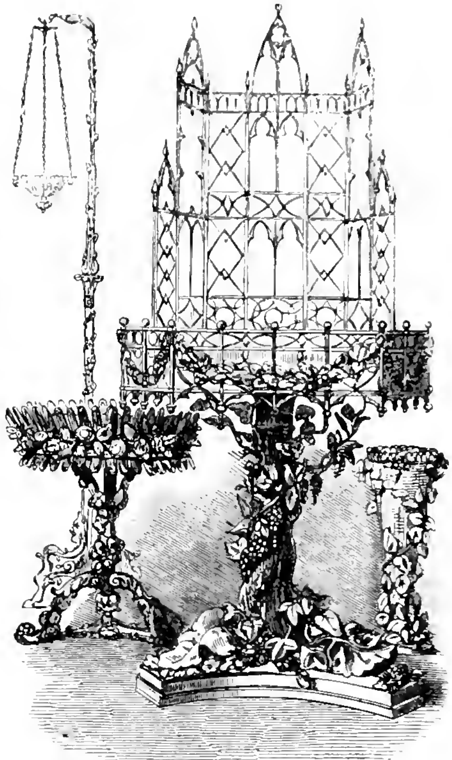
The productions which this country exhibited, comprised objects representative of every Class of the Exhibition, and were of a valuable and attractive character. In the Classes of Raw Materials and Produce were included several preparations for paints, cements, colours, &c. Agricultural produce and articles of food, particularly a large pasty of preserved meats, were also exhibited. Some of the chemical substances obtained from potato-starch, and used in the arts and commercially, were likewise represented. Among chemical substances of another kind, interest was excited by the appearance of chrysammic acid, and some of the brilliant dyes obtained by its use. The textile productions of the Netherlands were represented by several exhibitors of silk, woollen—particularly blankets—and linen. Mineral manufactures and hardware had also their representatives. The agricultural implements exhibited peculiar features of adaptation to the continental system. An ingenious machine for making percussion-caps, completely automatic, and producing the caps at the rate of 8000 an hour, was interesting. A large sugar-cane crushing-mill exhibited some peculiar, and, it is stated, improved features of general construction. Among philosophical instruments there was a dynamometer for ploughs. Models of bridges and locomotive apparatus, and some models of cutters and boats, illustrated the Classes to which they belonged. Some good specimens of crystal chandeliers and flower-vases formed an imposing feature in this collection. Articles of jewellery, a few sculptures, and books, complete the succinct summary of the objects contributed from the Netherlands.

IVORY CASKET. BY KLINGSEY.

In the Denmark Court, the contents of which were very limited in quantity, there were yet some very elegant and pleasing productions in fine art. Of this character was an ivory jewel casket, ornamented with bas-reliefs and a group after Thorwaldsen's "Ganymede." The style of execution is very perfect, and almost worthy of comparison with works of the cinque-cento period.

HUNTER AND TIGRESS, BY JERICHAU, OF COPENHAGEN.

This plaster group evinces wonderful spirit, and is extremely correct in execution. The hunter has snatched away one of the tigress's cubs, and she rushes wildly upon him to recover it, or revenge its loss. The attitude of the hunter, who aims a blow in self defence, is full of energy and truth.



RUSTIC FURNITURE, FROM THE NETHERLANDS.

WORK TABLE, FROM HAMBURGH.

The rose-wood table, with bag in crimson silk, is a very pretty design of the eighteenth century, and German fashion, containing numerous divisions boxes, &c. The effect of the chenille fringe is very good.

RUSTIC FURNITURE.—FROM THE NETHERLANDS.

In the Netherlands department we observed a great variety of rustic furniture, constructed of reeds and light woods, which, with great lightness appear to combine durability. The forms are agreeable, and adapted to that great English essential, for which there is no word in the French vocabulary—"comfort."

Fire-extinguishing Machine.—This automatic contrivance was exhibited by Mr. Bergin, for extinguishing fires in laundries and other parts of a building specially liable to such accidents. The inventor proposes to have a large tank, containing water, fixed at the top of the room; this tank to be perforated with holes, and to be fitted with a valve plug, like a shower bath; the plug to be held down by a string, to be fixed near the most combustible materials; in case of fire, the string would be burnt, the plug would rise and a deluge of water be showered down on the incipient fire.

MECHANICS AND MECHANICAL CONTRIVANCES.

CENTRIFUGAL PUMPS.

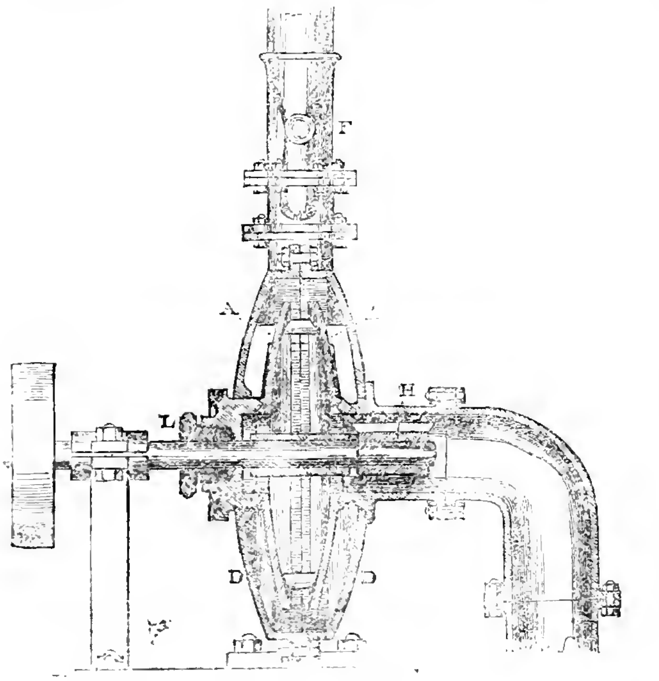
(*Continued from page* 136.)

GWYNNE'S DIRECT ACTING BALANCED CENTRIFUGAL PUMPS.

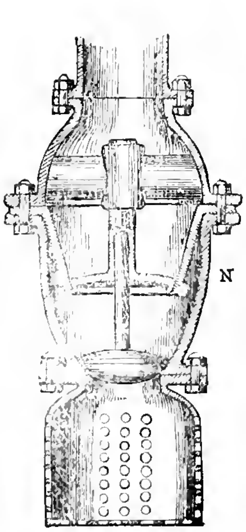
UNLIKE the cumbrous inventions of antiquity, the "Balanced Centrifugal Pump" is quick in action, small in size, compact in structure, capable of being placed in any situation, and of being applied to every description of work. Differing from the household pump, its power may be indefinitely increased, its volume of water made ample, and its flow continuous. Superior to the forcing pump, it has scarcely any appreciable friction, is not restricted in action by the intervention of an air-chamber; and contrasted with what must be regarded as merely engineering curiosities, some recent examples of which are constructed under an imperfect apprehension of the laws of centrifugal force, it has no parts which can get out of order, no useless reduplications of apparatus, and none which can in any degree impede the flow of water.

The details of construction will be readily understood from the following technical description of the plan, figs. 1, 2, 3, 4, 5, and 6, the discs, and the vertical section, which we give of a pump, when fitted with all its parts complete.

CONSTRUCTION OF THE PUMP. (See Engraving, Sectional View.)—



The piston is formed of two concave discs, A A, shown in the vertical section, placed parallel, with their concave surfaces towards each other. Two saucers, placed in corresponding positions, would give a popular idea of the arrangement. Between these discs is a single arm or impeller, B, radiating from a boss or hollow axis, C, mounted on a shaft which works horizontally, vertically, or at any intermediate angle. The impeller, which regulates the distance between the discs of the piston, varies in breadth. Its narrowest part is at the outer edge, *a*, of the piston, and it becomes gradually broader until its edge intersects the inner surface of the opening in the suction side of the piston, from which line to its extremity, at the boss, its edges continue parallel to each other, and at right angles to the axis of the shaft. Its breadth is varied in such a ratio that the areas of any section cut from the piston by the surfaces of circular cylinders, whose axes coincide with that of the shaft, shall be equal to such other section at any distance from the centre; and these areas are made equal, in order that the column of water, or other fluid, entering the piston when in a state of revolution, may have an uninterrupted flow from the centre to the circumference, and that the quantity received and discharged may be properly proportioned to avoid undue friction, and yet prevent reaction. This is considered essential



when large bodies of water are to be discharged, or when high velocities are required. The discs or inner surfaces of the piston, do not, as will be perceived on reference to the sectional figures, meet at their outer edges, but leave an annular opening, *a a*, around the whole circumference. This annular opening may be closed by a band of metal (or the whole piston may be cast in two halves); and in this band is cast a series of tangential openings, as shown in the engravings, figs. 1, 2, 3, 4, 5, and 6.

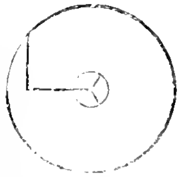


Fig. 1.

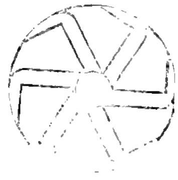


Fig. 2.

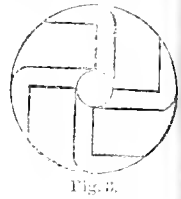


Fig. 3.

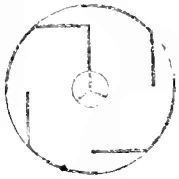


Fig. 4.

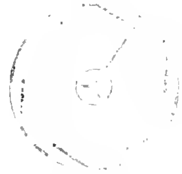


Fig. 5.

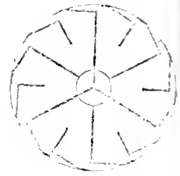


Fig. 6.

The form of piston may be varied, and the number of impellers and tangential openings increased, according to the diameter of the piston, and the nature of the substance required to be acted upon. From one up to thirty-two openings have been used; but it is desirable that the aggregate area of these openings be not more than equal to the area of the opening at which the water is admitted into the piston. (See figs. 1, 2, 3, 4, 5, and 6.)

In working the pump, the water is drawn into the piston, at its centre, through a circular opening in one of its sides, and concentric with it, as seen at n, by means of the suction-pipe N.

The area of the central opening, and of course, of all the others, depends upon the object to be obtained, and the determination of them is regulated upon the principle above-mentioned, and by considerations of the quantity of water to be discharged.

The piston is enclosed in a case D D, of circular form, placed parallel, and concentrically, with the discs, and this case, which acts as a receiver, is bolted to any convenient stand or frame E E. From the circumference of the case or receiver, rises at a tangent with it, the perpendicular discharge-pipe, F. The area of this receiver exceeds both those of the discharge-pipe and of the annular openings on the circumference of the piston, in order that an uninterrupted flow of the water may be maintained. A space is also left between the sides of the piston A A, and that of the case D D, at least equal in size to that of the annular openings in the sides of the piston.

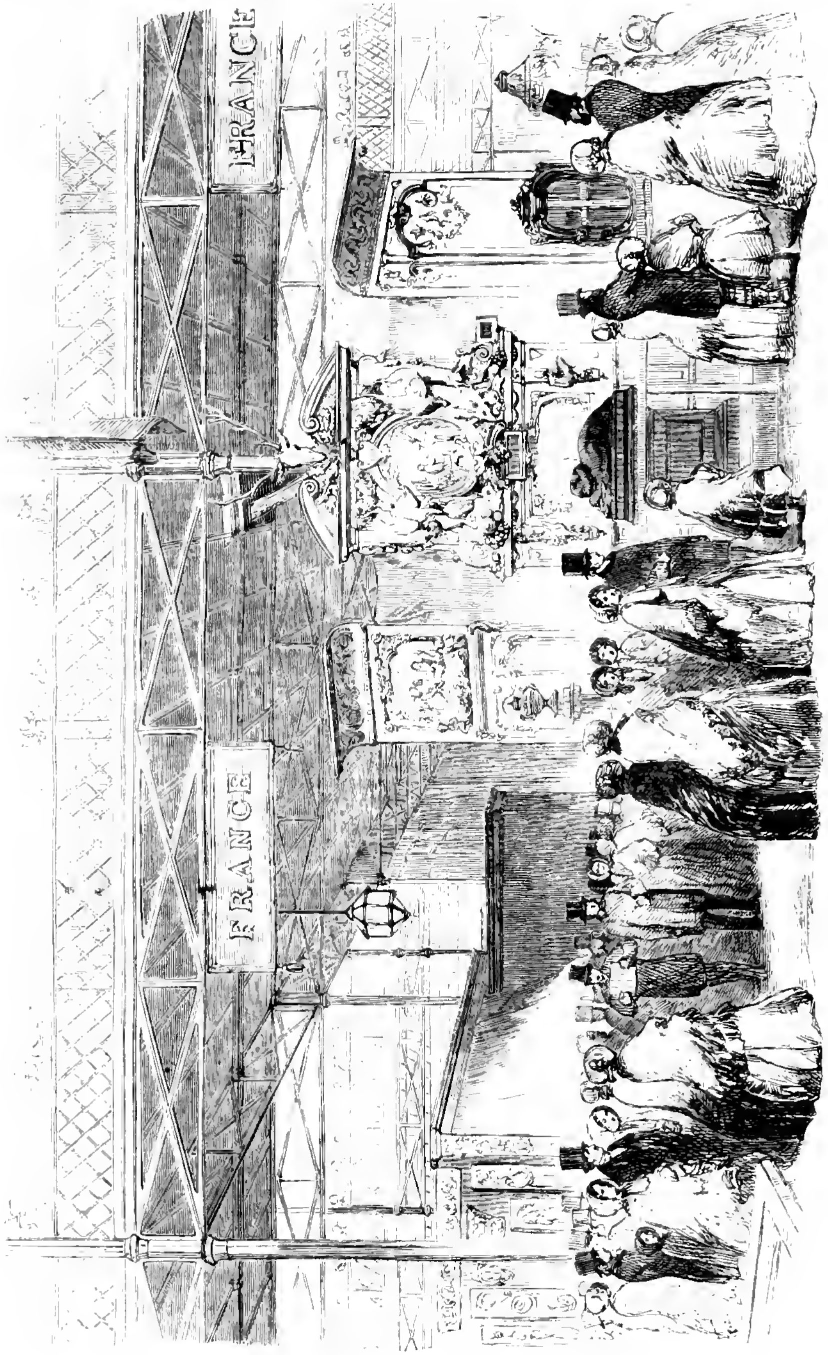
Around the central opening in the sides of the piston is a collar or projection, extending outwards half way to the case D D, where it is joined to the suction-pipe, which pipe is riveted or bolted to the outer case. The inner end of this pipe has cast on it a collar or projection, corresponding in shape, and concentric with, the collar on the piston. The joint between the suction-pipe and piston being carefully made, and so situated that no sand, gravel, or other gritty matter can lodge on or near it, the wear is so reduced as to become imperceptible. This joint, it must be observed, is an important feature in Mr. Gwynne's invention. The suction-pipe may be curved at its outer end, if desired, as shown in our engraving, and its internal diameter may be made larger than the opening into the piston, so as to compensate for the bearings, H H, cast in it, and which carry the inner journal of the shaft, M; and it is found that the water lubricates these bearings so effectually that very little wear takes place. Mr. Gwynne has recently examined one which has been running day and night for six months, and no perceptible wear had occurred.

The outer, or opposite end of this shaft, upon which the piston is fixed, is supported by the bearings at E, and in a hollow nut shown at L. This nut has a most important function assigned it by Mr. Gwynne, which he calls the balancing nut. After passing through this nut, the shaft M is embraced by a stuffing-box and gland, which prevents the water from escaping. At M, on the main journal of the shaft, is a pulley or pinion, to which power for driving the pump is applied from any first or prime mover.

The other applications of this pump, as improved by Mr. Gwynne, are far too numerous to illustrate in detail. Amongst some of its most important adaptations may be named:—

1. A continuous supply for towns. 2. As a pump and fire engine for ships. 3. Works of drainage and irrigation. 4. For manufacturers and large establishments for extinguishing accidental fires.

It will discharge, according to the statement of the inventor, a quantity of water fully equal, under favourable circumstances, to 90 per cent. of the driving power—a result attained by no other pump. He adds, "All other rotatory pumps, working with surfaces in contact, are speedily destroyed by sand, mud, or other foreign matters in water; but none of these cause injury to this pump. The larger sizes will admit the passage



VIEW IN THE FRENCH DEPARTMENT.

SIDEBOARD—FOURDINOIS.

of the design is too small; and the petty conceit of coupling the dogs at the base, although a topic of admiration for young ladies and gentlemen, is too serious a breach of taste to be slighted; the deer resting on the banquette, or rather where the banquette should have been placed, is likewise a specimen of that false spirit of æsthetics, which supposes that because nature is beautiful in itself, literal imitations of nature are equally beautiful in all places. It will be noticed that the Engraving shows the picture which occupies the centre of the design as darker than the whole frame-work: this is the reverse of the fact, but its success shows what ought to have been the case. It is to be regretted that anxiety for brilliancy of effect has caused the introduction of side brackets for lights between the figures; now the middle division is lighter than the lower and upper stages, and the top is heaviest of all.

ARTS OF DESIGN AND DECORATION

ARTISTS' IMPLEMENTS, &c.

FROM the earliest history of painting, we learn that artists were invariably in the habit of mixing their own colours and making their own brushes. This practice has continued within comparatively a few years of our own time. For information with reference to the former fact, we would refer to Mrs. Merrifield's elegant translation of Cennino Cennini's "Treatise on Painting," which was contributed to our art literature in 1844, and deserves to be extensively known. There are but few, if any, of our artists who now grind or temper their colours, but who, on the contrary, prefer purchasing them from the colourmen ready for use. This practice forms a new era in art, and it may be one of considerable consequence to its progress. The artists, it must be admitted, thus gain some advantage over the old method; although that knowledge of the properties of each colour, its durability or fugaciousness, with which the masters of old were necessarily acquainted, is by this course, in most cases, denied to the moderns. So seductive is this plan, that even the artists of Italy, of Holland, &c., have, upon their arrival in England, fallen into it. It is well known that Mr. Sang, amongst these, when he left Rome for England, partook of the system generally adopted here. This facility he found to his cost not always advisable with regard to every colour; and he had to fall back upon the practice of his native country, and that of many of his Munich brethren in art, and he prepares most of his media now himself, and hence that unrivalled brilliancy and transparency of tints as exemplified in all those of his works painted within the last six years. It may be questioned whether the permanence of ancient pictures is not attributable to the elaborate insight of their painters into the nature of the pigments they made use of, and, above all, to the simple manipulation of their works, and the few colours actually enlisted into their service. It is obvious that the number of colours since the time referred to has been considerably augmented; and now, as may be seen by any list procurable at artists' warehouses, they amount to an aggregate almost sufficient to deter the beginner from entering the lists of art. To those who would wish to make themselves conversant with the several names and the properties of pigments, we would recommend an attentive study of Mr. Field's "Chromatography," who, to a profound chemical research into the capacities of all colours for good or ill, adds much general information invaluable to artists. Upon matters of detail it must be obvious we should be necessarily terse; although it is difficult, at the same time, to confine ourselves to generalities where the subject is so replete and tempting; and therefore we plunge at once *in medias res*. It is then with "Artists' Implements" of our own period with which we have to deal, and as they were represented at the Exhibition of which we have to write.

No. 1, in the Fine Art Court, showed us several contributions from Mr. T. Miller, of Long Acre. These consisted of specimens of paintings in "silica colours" and "glass medium," but which appeared to exemplify no one particular virtue unattainable by other pigments.

Most of the pictures themselves, more particularly that of the "Genius of Peace," were distinguished for considerable ability in handling, and a correct probationary course of study. In that of Mr. Courbould's "Britons deploring the Departure of the Romans," we fancy we detected amidst its "trick," more particularly in the orange mantle, in the surge of the sea, and on the shore, an indication of "body," and the presence of a medium which belongs less to the element of water, than of that of gums, resinous compounds, or of oil. As a work of art, we object not to the use of any extraneous aid; we have to deal with it as an evidence of the powers of a particular and express fact; and we could, therefore, have desired that, for the sake of art, that which appeals to us as possessing extraordinary claims upon attention, should have brought with it the first necessary proofs of superiority.

The brushes in this case appeared admirably made; and, in this respect, Mr. Miller, we believe, stands almost alone, having had a long practical experience in this branch of trade, which requires an intimate knowledge of the wants and caprices of the artist.

Rowney and Co., of Rathbone-place.—These exhibitors savour a good deal of the fashion of the time, and gave us an almost bewildering classification of colours. Their dividing Naples yellow into tints is, however, a valuable exception, and their desire to supply the artist with a cheap, and, at the same time, a good article, is entitled to praise.

W. H. Kearney, Brompton, gave examples of crayon painting, executed with his Venetian pastils, which are impervious to damp, and, therefore, adapted to many decorations hitherto beyond the reach of ordinary painting.

Robertson and Co., of Long-acre, showed a very good selection of canvas, painting-brushes, and pencils, which was indicative of a sterling respectability without meretricious allurement. The palette-knife, for placing the colour on the canvas or panel, without the aid of the brush, is a neat adaptation of the common trowel-handle, and will be found of much service, where boldness of impasto is required. There were several specimens of water-colours, in collapsible tubes admirably adapted for sketching from nature; and a newly-invented oil sketch-book, very light and convenient, and which enables the sketcher to carry two wet paintings without injury. The prepared canvas in the same case was worthy of remark, from its being a successful attempt to give to that fabric the surface of fine panel.

Messrs. Reeves and Sons, of Cheapside, contributed a case of some importance to artists, inasmuch as it contained the proofs of an efficient substitute for the far-famed black-lead mine of Cumberland, which is now thoroughly exhausted. It is well known, that, for all purposes having reference to art, this lead of Cumberland was unsurpassable; that no other could compare with it in quality of colour, absence of grit, or was so easy to erase; indeed, that no other yet found could be thus made use of in its natural state. That from the Balearic Islands is "cindery," that from Ceylon, though purer than any plumbago known, in the excess of its carbon, and the small portion of iron and earthy matter, is too soft and flaky; that termed Mexican is really produced from mines in Bohemia, and is also friable and earthy. Other varieties, from Sicily, from California, from Davis' Straits, and elsewhere, have been tried, but all have proved unfit for the use of the artist. Cumberland lead is the only black-lead that in its native state could be cut into slices, and thus be inserted into the channels of the cedar pencils: this being alone a remarkable test of its superior fitness as a native lead. The substitutes for Cumberland lead are manifold, some or all of the varieties of the leads before mentioned being worked into pencils variously designated "prepared," "purified," or "composition." These different leads, by means of gums and resinous matters, are either kneaded in a plastic state and forced into the channels of the cedar wood, or more frequently combined and ground with substances with which they will bake to the required hardness, or with others which will fuse, and the mass solidify when cold. Lustre, intense colour, freedom in working, and ready erasure, Cumberland lead possessed in an eminent degree beyond all other leads known; but its uncertain temper and occasional grit—properties common to all leads in a natural state—gave rise to its amalgamation with other substances which have been enumerated; and though some of the qualities in which Cumberland lead failed have been obtained with varying success by these amalgamations, its especial and valuable qualities when pure have in the same ratio been deteriorated and destroyed. Thus the artist has been left to choose between the evils of a native and a spurious lead, until the somewhat recent discovery by Mr. Brockedon of a process by which Cumberland lead is made perfect. It would seem that these pencils are especially made for Messrs. Reeves and Sons, and that they are unquestionably what they affect to be.

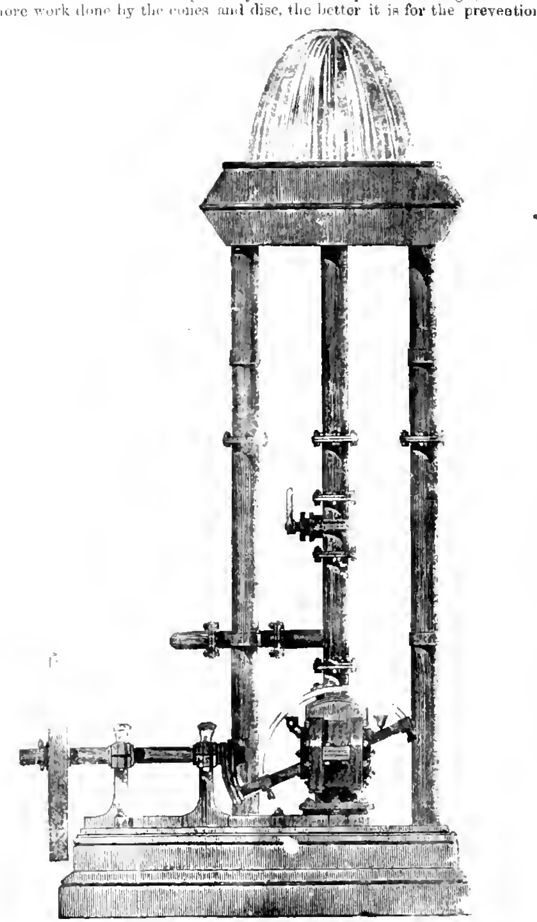
Another important evidence of successful trade enterprise in aid of art is to be found in the water-colours prepared with wax, as was shown in this case. They dissolve with ease, possess great volume and transparency; and, moreover, they cannot be converted into flint by hot temperatures, so often the fate of the ordinary water-colour. The introduction of a medium of the purest wax into the manufacture of water-colours was a stage in the art of water colour painting deserving of honourable mention. It has given to this delightful department of art facilities of unapproachable character, and tended to rank it very close to that of oil, which it surpasses in its powers of drying, the advantages of smaller space, and ease of carriage. Very many have been the attempts to give body to the colours used with water, and a variety of media have been used for this purpose. One of these is the more particularly worth mentioning, as showing the avidity with which anything new is seized upon, even by the intelligent and discerning, and the effects which followed a too confiding credulity. We allude to the use of honey for the purposes above stated. This medium certainly had the desired result of keeping the colour with which it was mixed in a moist state; indeed, if the brush was too fully charged with it, those parts of the drawing to which it was applied would not, unless in hot weather, or in a warm room, dry for some time; and even when dry, such drawings, if exposed to a humid atmosphere, became "tacky" again in their folio or elsewhere, and stuck to their unctuous companions in the most sweet but destructive union. A drawing finished with these colours could not be left a moment with safety. The flies, attracted by the tempting treat, would moisten the choicest parts with their probosci, and tattoo the human face divine, or give to that of lovely woman all the appearance of being ravaged by small-pox. It was no unusual thing to find a flock of sheep disappear from a common, a *château* shattered and unroofed in a night, and a litter of pigs and a cow or two carried away in a *fly*. Nor was the artist himself exempt from the annoyance of their perseverance and pilferings. To paint from summer nature in the open air was to look through a swarm; and the head of the luckless draughtsman became like a hive in the midst of it.

The allusion to a temporary false step in the onward progress of chemical research in art naturally, although in a very opposite category, directs our attention to the subject of "frauds," a very strong term, but nevertheless true—frauds upon artists. It must be in every father's experience—in that of every director of youth—that there is a particular period in a boy's life when the yearning for a "box of paints" becomes positively painful, according to the amount of difficulty which surrounds its possession. A guinea obtained, the next fancy stationer's is resorted to for the much-coveted box. There it lies upon the counter, with its lid slightly and mysteriously raised, displaying just enough of its contents to increase a desire of owner-

of solid substances of 1½ inch in diameter, and others in proportion. Those designed for vessels are so arranged as not to be choked by corn, chips, raw turpentine, coal of small size, paper, pulp, sand, or other impeding substances."

DONKIN'S DISC PUMP.

THE pump exhibited by Bryan Donkin and Co. is on the disc principle, the spherical cylinder of which has a diameter of 15 inches, the cones and disc, which act the part of a piston in ordinary engines, being required to have their surfaces most perfectly finished to prevent leakage, and the more work done by the cones and disc, the better it is for the prevention



DISC PUMP.—BRYAN DONKIN AND CO.

of any leakage, as they must necessarily fit still closer. The angle of the cone is 18 deg., and the contents of the cylinder 478 cubic inches. The greatest number of revolutions which can be effected by this sized pump is about 90 per minute: thus the quantity of water raised in that time would be equal in bulk to 24 cubic feet; and the altitude that would be attained would be 60 to 70 feet in height. The pump would certainly have been exhibited at the Exhibition to greater advantage had the cylinder been increased in size even to a very small degree, as, by an increase of 4 inches diameter, double the quantity of water would be raised, the contents increasing as the cubes of the diameter. To all appearance, there are four delivery-pipes; but this is not the case, as we have already mentioned, the three outer ones being for the waste water, while the centre one alone is for the purpose of delivery. A water-meter is attached to this delivery-pipe, having a diameter of five inches, the cubical contents being equal to a pint, and the size of the pipe fixed thereto being of one inch diameter. The advantage of this meter is, that it may be worked under any head of water, without any alteration being made in it; and the water will exert the same pressure at the outlet as at the inlet, deducting the small amount required to turn the index. Another advantage is, that, whether a cock or sluice be opened slowly, or only partially opened, the amount passed through it will be indicated in an equally accurate manner.

FILTERS.

HIGH-PRESSURE FILTER.—Among the filters exhibited was this apparatus, consisting of a hollow sphere of iron, into which there is fixed a smaller hollow ball of sandstone, between which and the iron the water to be filtered may freely circulate; it being admitted into the space from a considerable height, so as to obtain the requisite pressure for forcing it through the pores of the sandstone in sufficient quantities. A tube fixed into the hollow sandstone globe is connected with the pipe for drawing off the filtered water, so that none of the liquid admitted into the iron sphere can escape without passing through the stone globe. There is, however, another pipe, which is connected with the unfiltered water, and is supplied with a stop-cock, by turning which the water in contact with the exterior surface of the sand-globe rushes out. By this means the solid matter that is strained from the water, in passing through the stone, is washed away, and the apparatus is cleaned. This apparatus is, however, but a modification of the old sandstone filters, in common use before the introduction of filtering machines. The water, instead of being poured into a sandstone basin, and allowed to pass through the pores by its own pressure, is now introduced on the outside of two sandstone basins joined together; and additional pressure is applied by enclosing the united hemi-spheres within a strong iron sphere, the water being forced from the outside to the inside of the basin, instead of percolating from the inside to the out. The new plan has in principle many advantages over the old filter. First, the pressure is equal over the whole surface, consequently, every portion of the water is equally purified, and, as the whole exterior of the ball operates at the same time, a much greater filtering surface is exposed than when the pressure is from within, and acts only partially. A small sand-ball of 4 inches diameter filters as much water in a minute as would percolate through the old sand-stone filters in a day.

THE SYPHON FILTER is, perhaps, the most convenient kind for general purposes, as it may be readily carried about and used by any ordinary available pressure. The shape of the filter is that of an elongated bell. It is made of white metal; and at the top of the well-shaped vase there is inserted an inflexible metal tube, furnished with a stop-cock near the end. The vase is filled with powdered quartz of various degrees of fineness, and the mouth of it is closed with a perforated cover. When required to be used, the vase is inverted in the water to be filtered, and the tube is allowed to hang below it. When the air is withdrawn, the water rises through the powdered quartz, and fills the tube: and by syphonic action, the water is drawn down by its superior gravity. The lower the tube the greater the pressure, for the weight of water flowing down operates on the filtering surface as directly as if the same column of fluid were placed above it. The amount of pressure is, however, limited to that of the pressure of the atmosphere; for were the tube lengthened beyond 30 feet, the column of water would separate and leave a vacuum. This filter renders the muddiest water beautifully clear when acting with a pressure of not more than 2 feet at the rate of 4 gallons an hour.

GRAVEL FILTER.—In this apparatus, water is purified by passing through layers of sand and gravel; and it may be fixed to the pipe from a cistern, so that filtration is always going on. The water is admitted at the bottom, and rises through the gravel thoroughly filtered, into the reservoir. The same pipe that supplies the filter is connected with the stop-cock from which water is drawn, and the flow of the current through the bottom of the gravel keeps the filter clean. Whether fine gravel, sandstone, or powdered charcoal be employed, is quite immaterial; provided the interstices be sufficiently fine to prevent the particles, mechanically suspended in water, from passing through.

CENTRIFUGAL FILTER.—A model of this apparatus was exhibited. It professes to purify two million gallons of water per diem. The filtering materials are felt and canvas, enclosing a layer of sand, placed round the circumference of two discs, kept apart by partitions, in the same manner as in the centrifugal pump; the pressure being similarly obtained by "centrifugal force." Rapid rotatory motion is given to the apparatus, by which means the water admitted in the centre is forced through the felt and sand at the circumference. This filter would require a great amount of power to work it, to produce the discharge promised; and, if mechanical power be employed, it would be better to apply it directly to force the water through the strainers.

VIEW IN THE FRENCH DEPARTMENT.

THE view in the French Department engraved in the present sheet comprises a variety of interesting objects in Carton Pierre, Wood-Carving, and other materials for room decoration, in the production of which the French are justly celebrated.

SIDEBOARD, BY FOURDINOIS.

THIS, which is one of the best pieces of French furniture sent to our Exhibition, and received the honour of a Council Medal, deserves particular attention for the thought which has been bestowed upon its design; and which is more evident therein than in any other similar work of foreign taste.

The four figures, instead of being the usual repetition of the emblems of the quarters of the world, are representations of the dessert, wine, coffee, and tea: beyond this judicious choice of ornament, the spectator observes that the intention of each figure is so clearly and cleverly marked as to be unmistakeable; this is a virtue too often wanting in more ambitious works, to be passed over in silence. The figures on either side represent fishing and hunting; all are beautifully sculptured. The little figure at the top

ship. The prize secured and borne homeward, paper ready, and plate upturned, the attractive colours are rubbed one by one in neat array upon the delf. A good specimen of water colour has been "lent to copy," and now comes the first essay. All the efforts of the tyro to imitate the flat tint of its sky or the rich impasto of the foreground are of no avail. Time and perseverance but add to the vexation. His colours are poor, weak, thin, and washy. He is, however, ignorant of this fact. Young and confiding, the shop which boasts of being "established" at a period when his father was a boy, would never stoop to cheat. He throws aside this attempt and tries again. The acrid qualities of the colours either penetrate through the paper, or, for want of sufficient grinding, their crude and earthy particles are floated about for an instant on the surface, and the next left in spots and patches. Here is a young and ardent lover of nature, stimulated by a noble mind and an intellect delighting in invention, shamefully surrounded in his first encounter by disheartening difficulties, which are the more serious because their cause is not understood. At the very threshold of the temple of art he is rudely repulsed by the sordid and fee-seeking, who sell him a clumsy and useless key, and falsely deny that either Talent, or his senior partner Genius, are within. There exists not the shadow of excuse for this abrupt rebuff. The profits upon art appurtenances are large and ample; and the thus adding to positive extortion, the intimidation to modest merit, is as cruel as it is dishonest. But, says the advocate for cupidity, any description of colours will do for a boy to begin with. Then, if such be the case, why charge as for the best? But it is not the fact. It is true that there are professors (save the mark! it is a correct one) of music, who do not hesitate to set a girl down to a piano "of any sort;" but will any rational person, who is impressed with the divine gift of the appreciation of sweet and harmonious sounds, affirm that such a course would not tend to vitiate taste and injure an otherwise correct ear?

We shall add a few more remarks, partly borrowed from an article by Mr. Brockedon, upon the black-lead pencil, a more important auxiliary to art than would at the first thought be supposed. It is not generally known that lead dust, or inferior plumbago, is combined with sulphuret of antimony, or pure sulphur; and the greater the proportion of this ingredient, the harder the composition. When ground with the lead—generally that called Mexican—the compound is put into an iron pot, or frame, and subjected to the degree of heat required to semifuse the combining ingredients. It is then, whilst hot, put under a press, and kept there until it is cold; when it is turned out as a block, ready to be cut into slices, and inserted in the cedars.

The impossibility of rubbing out a composition when sulphuret of antimony is used, led to the rejection of the sulphuret and the employment of sulphur only, treating these ingredients as before. This makes a better composition in the quality of rubbing out, but possesses, in a greater degree than the former, a serious evil. The sulphur is readily set free by bodies which attract it, and memoranda made with this composition can be reproduced although rubbed out, so far as with such composition is practicable. If the place where the writing was, be wetted with an alkaline liquor, a sulphate will be formed; and if, after drying, it be again wetted with acetate of lead, it will exhibit the writing in sulphuret of lead. This is obviously a most dangerous property for persons who may require to make notes not intended to remain or be again producible. To an artist it may be very injurious as regards the purity and security of his productions, for many of the colours which have metallic bases, are liable to be affected if they come in contact with the lead of sulphured pencils. A ready and simple experiment will place our readers in possession of an infallible test, and thus protect that portion of them with whom the fact is of consideration from so deceitful an instrument. Draw some lines with the suspected pencil on a sheet of paper, and place these lines in contact with any bright, smooth, silver surface—a spoon, for instance; in a few hours, if these lines contain sulphur, corresponding dark lines will be found on the spoon, formed by the action of the sulphur on the metal. A good black-lead pencil may yet more readily be known. It should work freely; be free from grit, yet without a greasy, soapy touch; bear moderate pressure, have a lustrous and intense black colour, and its marks be easily erased. It should be borne in mind, however, that no pencil appears to be the same at all times. This arises from the nature of the paper, whether hard or soft, or the condition of the atmosphere, which affects it materially. The same pencil, on smooth or rough, moist or dry paper, will mark as if four different pencils had been used. The softer or darker degrees of lead are weaker, and yield more readily than the harder varieties.

The varieties of German pencils, with ornamental exteriors, which have recently been imported in large quantities, are, it appears, made of clay mixed with Bohemian lead, and a glass which fuses at a moderate temperature: these materials are ground in water together, and dried slowly to a stiff plastic state, and then put into a vessel like that used for forming maccaroni: under a powerful press this composition is forced through holes in the bottom of the vessel, thus forming the material into square-threads of the required sizes. These are laid in convenient lengths in wooden troughs, which keep them straight until they are thoroughly dried. They are then laid in similar troughs or channels on iron plates, and put in a muffle or furnace, subjected to a degree of heat sufficient to render them hard and insoluble, and are then placed in the channels cut into the wood, and glued there: the different degrees of hardness depend upon the proportion of the ingredients. All these pencils, however, are harsh in use, and their marks cannot be entirely erased.

Green and Fahey, of Charlotte-street, Portman-place, exhibited folding drawing models in three series, illustrative of perspective, and the principles of light and shade, which will be found of service both to master and pupil in the elementary studies of art.

J. E. Cook, of Greenock, exhibited prepared panel for artists' painting, which requires but a day or two to be ready for the artist. Mr Cook is deserving of much praise for this attempt to give facilities for obtaining material to the young beginner, who is too often cramped for the want of the necessary funds. It is related of Wilkie, that, by partly pulling out a drawer from a set, he made himself an efficient easel; and of Sir Benjamin West, that he obtained his first brushes by taking the hair off the tail of a favourite cat.

F. Harvey, of Oxford, showed an easel for artists sketching out of doors, containing everything required. This is a judicious arrangement of materials, and one hitherto much wanted. We trust, it will not be long ere greater activity be given to the trade of which Mr. Harvey is a member, by the appointment of professorships of painting, sculpture, and architecture at our Universities. Why should not the youth of England, in their more docile years, acquire a taste for, and a love of, art, the more as they are in after life to become patrons, and sit in learned conclave as committees of taste upon the merits of the rival works of the greatest men of their day. It would tend greatly to rescue them from egg-throwing and chicken hazard, and other low and frivolous pursuits, too often the resource of those who have nothing to do, rather than the offspring of innate vice. The sister arts have their professorships; why, then, should painting be driven from the seats of learning?

E. F. Watson, of Piccadilly, sent some excellent specimens of gilding, which contrasted strangely with the cheap gold frames around. There are few artists but are aware how much their productions depend upon the frame by which they are surrounded; and while a picture shall appear surpassingly beautiful in one frame, it shall seem poor and ill-conditioned in another.

It may here be remarked, that the "cheap" frames, now so much in vogue, which meet us at every turn, are the dearest the artist can purchase. The yellow preparation of their groundwork, but once, and barely, covered with gold (and that "gold" too often of a spurious Dutch character), peers through in unutterable poverty of aspect upon the slightest contact or friction, while the warmth of a room creates gaping crevices at each juncture, and cracks and shrivels the composition ornaments as though they consciously shrunk from contact with the green wood and its shabby disguise, upon which they had been so unceremoniously placed.

J. W. Gear exhibited a composition to supersede ivory for large water-colour paintings. The inventor, who is likewise an artist, informs us that it can be manufactured of any requisite size without a join: the colours, he adds, appear brilliant and clear upon it; and, as it is capable of being used in every respect as ivory, without the brittleness of other substitutes, it will be found deserving at least of the attention of the artist. We have no other means of judging of its merits than by the single sample shown in the Exhibition, which, being completely covered with a drawing of but average talent, denied us all opportunity of doing more than quote its discoverer's book. This and similar inventions to supersede ivory, which *once* could only be obtained of a limited size, however praiseworthy, are, where this is the object, no longer of importance, as ivory, by rotatory motion and fixed vertical saws, can now be cut into sheets of almost any extent. This observation will therefore likewise apply to

Sir W. Newton, who contributed several miniature paintings of his own, to exemplify a power he possesses in secret of "joining ivory together without the seam becoming apparent." These specimens were however, unfortunately selected for the purpose. The seams, to our eye, *were* apparent, and more particularly in that of "The Homage," where a join runs the full length and breadth of the picture, in defiance of the thick and heavy "handling," obviously intended to hide it.

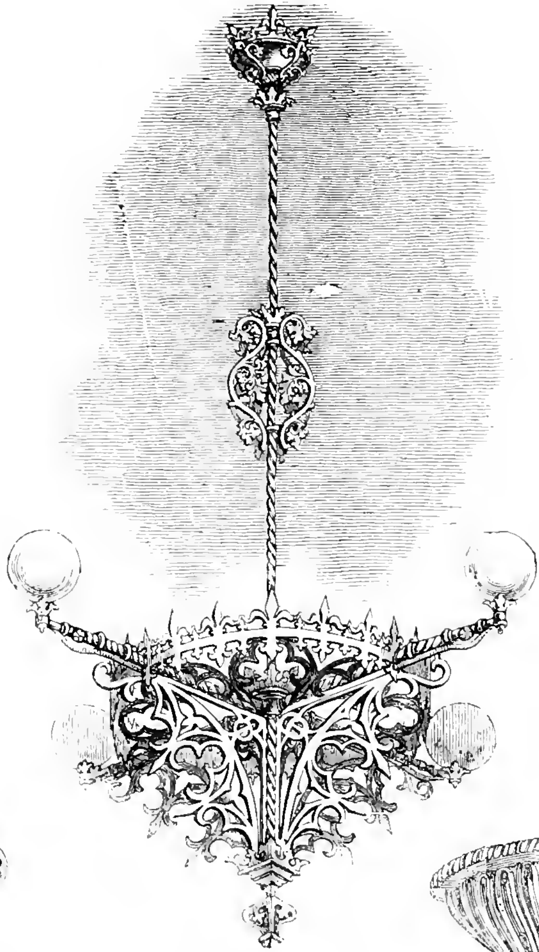
In Class 2, amongst the "Chemicals," was an exceedingly interesting case from the firm of Messrs. Winsor and Newton, of Rathbone-place. It is well known in the profession that these exhibitors are essentially practical men, and have very extensive chemical works for artists' colours in the neighbourhood of Kentish Town.

In No. 1, Class 17, a somewhat dark place, was a selection of fancy stationery from the old-established house of Ackermann and Co., of the Strand. Amongst it was a colour-box, fitted up with every requisite the amateur may desire; the whole arranged with great elegance and taste which we have engraved in a previous number.

Mr. Grundy, of Manchester, exhibited in Class 26, No. 121, some very beautiful specimens of frames, intended to display to the best advantage fine engravings, drawings, and other works of art, and adapting them for the tasteful embellishment of the drawing-room, boudoir, &c. Those for drawings are exquisitely beautiful; and by a simple contrivance, the works are sunk or inlaid in the *matte*, or mounting, which preserves them from injury, while they are likewise kept perfectly flat, and do not touch the glass. The frames are altogether lighter than usual, take up less space upon the walls, and have a charming appearance when relieved by a buff or scarlet ground. Water colour drawings, and the lighter descriptions of oil-paintings, are surprisingly benefited by this ornamentation, while prints appear to be very considerably enhanced in value by such means. The new method of mounting water-colour and other drawings, without cutting their edges, we believe, is due to Mr. Grundy; and the advantage of placing them beneath, instead of above, the card-board, &c., owes its origin to his brother, of Regent-street.

SIDEBOARD.—SNELL AND CO.

THE sideboard is of handsome proportions, carved in mahogany, of a rich colour, the slab of Galway marble. The glass, which is of wide dimensions, is rather unusual in shape; and the frame, of grapes, &c., is almost too light for the proportions, whilst the two figures painfully balancing themselves upon each edge might be dispensed with, with advantage to the general effect. The oval cistern beneath is handsomely designed and executed. The sculpturing is from designs by Baron Marocheti. But this work, if open to any animadversions on account of its variation from the usual routine, deserves praise for the very great elaboration beyond its execution, which fully maintains the reputation of the factory; the two figures, which are the first production of a carver, are finished in a manner equal to some of the most celebrated examples; and the foliage, with the fruit, and the magnificent cellaret, will extort from the spectator their due meed of approbation.



CHANDELIER.—BAILEY AND SONS.

CHANDELIER. BY BAILEY AND SONS.

THIS chandelier is fashioned after the mediæval period, and of very admirable material and workmanship. We do not, however, admire the style, nor the gaudy colours with which it was covered.

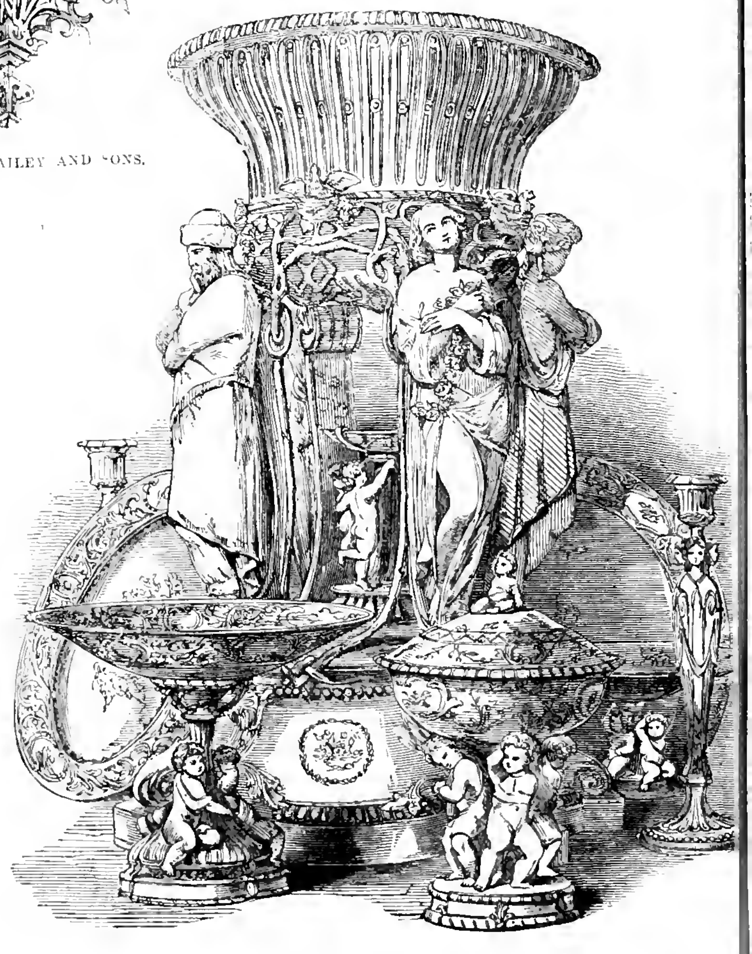
VASE IN MARBLE.—BY VAN LINDEN.

P. VAN LINDEN, of Antwerp, exhibited a very pretty cup, or vase, in marble, with four sculptured reliefs, from subjects in Spenser's "Faëry Queen;" viz., Cupid trying his bow; Conqueror of strength; Fidelity the end of his occupation; the whole surmounted with Cupid captive to Venus. It is very neatly chiselled, and wonderfully successful considering the material, the dimensions being such as would be more properly adapted to executions in one of the precious metals.

GROUP OF ORNAMENTAL CHINA, BY MINTON.

THIS handsome group forms part of the service of china presented by her Majesty to the Emperor of Austria.

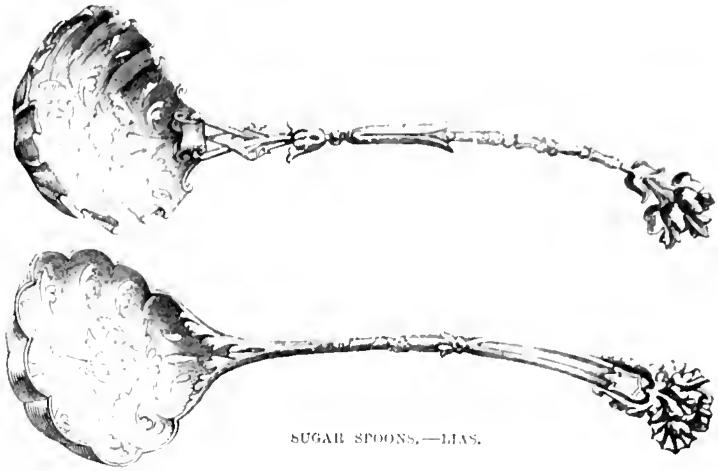
MARBLE VASE.—VAN LINDEN.



GROUP OF ORNAMENTAL CHINA.—MINTON.

CUT GLASS CLARET JUG. BY GREEN.

THIS very magnificent jug, which is of the purest glass, is very beautifully engraved with the Royal arms, and the national emblems of the three kingdoms.



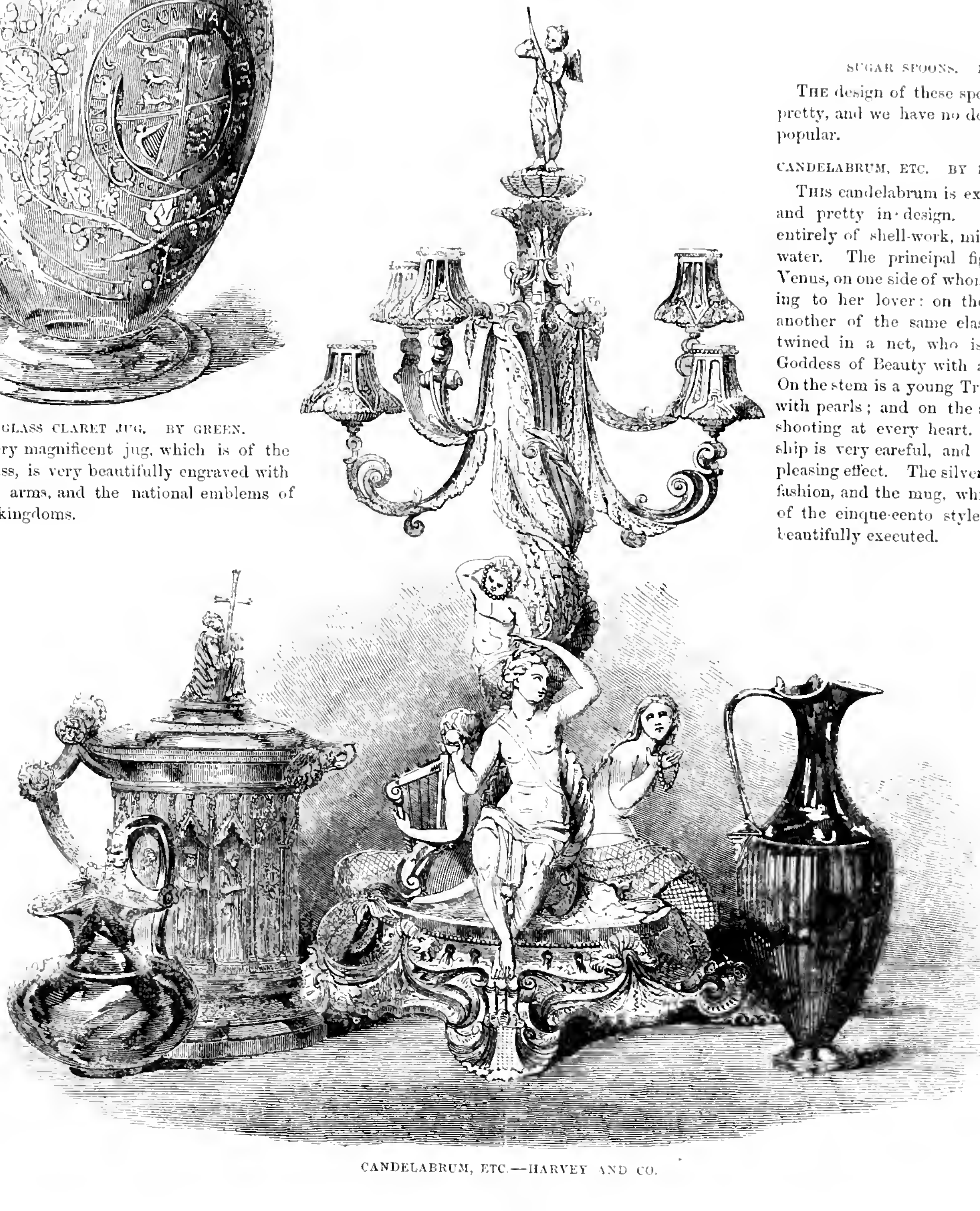
SUGAR SPOONS.—LIAS.

SUGAR SPOONS. BY LIAS.

THE design of these spoons is novel and pretty, and we have no doubt will become popular.

CANDELABRUM, ETC. BY HARVEY AND CO.

THIS candelabrum is extremely fanciful, and pretty in design. It is composed entirely of shell-work, mineral plants, and water. The principal figure is that of Venus, on one side of whom is a syren singing to her lover: on the other hand is another of the same class of beings, entwined in a net, who is presenting the Goddess of Beauty with a string of coral. On the stem is a young Triton covering her with pearls; and on the summit a Cupid shooting at every heart. The workmanship is very careful, and the whole has a pleasing effect. The silver ewer of antique fashion, and the mug, which is silver gilt, of the cinque-cento style, are both very beautifully executed.



CANDELABRUM, ETC.—HARVEY AND CO.

MISCELLANEOUS MANUFACTURES.

SADDLERY, HARNESS, AND HUNTING GEAR.

ENGLISH saddles may be divided into at least six classes; that is to say, those used for riding on the road or hunting, for racing, for the infirm or lame, for military purposes, for ladies, for children, beside the cheap articles made for exportation. The ordinary English saddle differs from that of all other countries, in the circumstance that it is constructed for the every-day use of horsemen, who can ride without other help than the balance of the stirrups and the grasp of the legs and thigh, who do not need either high pommel in front or high spreading cantle behind. In this country it is presumed that all ordinary shaped saddles may be used for hunting, and in hunting it is indispensable that the horseman should be able to slip away from his falling horse with the greatest possible ease. It is the universal passion of Englishmen for the chase which has driven the old-fashioned and rather comfortable demi-pique saddle out of fashion, ever since fast riding to hounds came into vogue. We are also the only nation that rises regularly in the trot, and that motion requires a flat saddle. As the best customers of our saddles are hunting men, they have rendered universal a form which is the very best for sportsmen, but very trying for foreigners. The demi-pique saddle, still in use in France, Spain, and South America, when well made, affords a very comfortable seat on long journeys on an ambling or cantering nag; but a roll over in topping a gate or wall in such a saddle would be certain death by impalement.

The only concessions permitted to timid, invalid, or lame riders, are in the way of saddles padded so as to support the thigh and press against the knee. These are commonly called "Somersets." Several specimens of equal excellence were exhibited, on some of which a one-legged horseman might find great assistance. A celebrated master of hounds in Wales is precisely so circumstanced. These are all worth examination, because it is a mistake to imagine that all persons who ride know how to sit. There are a very considerable number of persons who begin to ride late in life, either because they are then, for the first time, able to afford the amusement, or because they take it not as pleasure, but as physic by their physician's orders. Such persons will act much more wisely in purchasing a saddle well padded before and behind, and stuffed, than in running risks and making themselves ridiculous on a smooth plain hunting saddle. A great many attempts have been made to produce an elastic saddle, but with moderate success. Except for a very heavy man, an elastic saddle is a mistake. Steel springs, stretched webbing, and, lastly, caoutchouc cloth, have all been tried; but all the expedients for affording a soft seat have the same fault—after a short time the springs break, the webbing or India-rubber cloth stretches, and the saddle is spoiled. Good stuffing, covered with a thin waterproof cloth to protect it from the effect of a thorough wetting, will continue to form the best seat, until some mode is invented of removing worn-out bands. A saddle-tree was exhibited, covered with vulcanized India-rubber, which would, perhaps, answer as well as anything of the kind.

The best "old gentleman's" saddle in the Exhibition was by John Weir, of Dumfries, which is made of one piece of buckskin, without flaps, wadded, but so edged with hog-skin, that when mounted, the rider's person covers all the white leather. It would be very comfortable and easy to sit for the fattest man and clumsiest rider on common roads. The arrangement of the stirrups under the flaps would make it scarcely safe for hunting. Cox, of Walsall, had a new registered stirrup, which, although very ugly, is a move in the right direction, and would be an improvement to Weir's saddle. The stirrup hangs from a single strap, always in the right direction for use, and so may obviate the necessity of groping with your toe for the stirrup after dismounting, just as your horse is rising at a tough bullfinch. This form would be an improvement for ladies' stirrups, where the stirrup-leather is fastened on the off-side; but Mr. Cox's arrangement of an improved buckle without a tongue is quite inadmissible, as it would come most painfully against the leg of the horseman.

Mr. Ramsey, Hull, showed an elastic saddle, with very high testimonials; but in this, as in many other instances, without a dissection first, and a long trial afterwards, it is impossible to say anything positive.

Hudson and Lennan, both of Dublin, displayed excellent workmanship in hunting and steeple-chase saddles, which were neat and well cut, good material, and light. The 8lb. steeple-chase saddle of the latter was as good as anything of the kind in the Exhibition. But if our Irish friends wish to do any business in London, they must begin by undercutting the preposterous London prices. At present, the man who goes with money in his hand to one of the best saddlers has to pay at least 2*l.* extra, because other customers take four years' credit. Colegrave, Brighton, exhibited a saddle fitted with springs, attached to the girth-straps (a patent), to avoid the dangers of over-girthing. It must be expensive, soon out of order, and rarely necessary; good girths are elastic enough.

A much better thing of the kind was a saddle by Gibson, of Coventry-street, fitted with Reed's Patent Girth Regulators. Every one knows the awkwardness of having to take up the girths a hole or two on the hunting-field, on a hot fidgetty horse, after a sharp burst on a moist woolly day. The flaps of the saddle are probably covered with mud; and whether you dismount or sit on, you get the benefit of a streak of clay on your hands, your breeches, or your hat, while pulling at the girth tongues. By Reed's Patent, a small lever on the principle of a ship's capstan winds catgut, to which the girths are attached on a metal roller. The idea is extremely good. The girths may be tightened at either side, or even when cantering along, without lifting up the flaps of the saddle; but the mechanical arrangement might be very much improved, and, for that end, we direct the attention of our Walsall and Birmingham readers to it.

Thomas, of Stratford-on-Avon, sent flexible saddles, which are said to yield to the motion of the horse, and yet allow a free current of air between the back and the saddle. This is very desirable; but without a trial it is impossible to do more than direct attention to the promise.

Although there are plenty of good hunting saddlers, there were no other hunting saddles displaying any novelty among the few exhibited. It is to be regretted that the Walsall manufacturers did not make the class more complete by sending the good plain cheap saddles which they manufacture so largely for the foreign markets, at from 20s. and upwards.

Of racing saddles, several were shown; but for form, workmanship, and weight, nothing can exceed the one exhibited by Mr. Cooper, of York. The whole case was highly creditable; and the racing saddle was pronounced by one of the leading members of the Jockey Club the best he ever saw. This is worth noting because the maker has spent the greater part of his life in itinerating from farm to farm in the Dales of Yorkshire, mending cart-harness, and is almost self-taught as to fine work and taste. His Somerset saddle, also, is a piece of right good workmanship.

Of side-saddles, a goodly number were displayed, chiefly differing from each other in ornament. Several have Berlin wool work or tapestry let into the seat and near-side crutch. There is something pleasing to young ladies in the idea of turning their eternal fancy-work to some useful purpose; but the fashion will be of short duration, unless a mode can be found of cleaning the red, green, and blue worsted flowers without damage. The same objection, in a less degree, applies to white buckskin coverings on a saddle. It requires time and trouble to clean, and is only fit for those rich enough to have more than one. The greatest improvement in side-saddles consisted in the introduction of the third crutch, or, as it is sometimes called, the hunting horn-pommel; if this be well placed, the opposite crutch is rendered quite unnecessary, and the seat of a lady becomes as firm and safe under all circumstances as that of a man. Another improvement consists in making the cantle flat. The best side-saddle, without exception, in the Exhibition, was that sent by Urch, covered with brown buckskin. It is very light (only 12½ lb.), elastic, yet sufficiently strong. We had an opportunity, by sitting on it, on the stand, of ascertaining that the hunting horn-crutch is not only well placed on a level with the seat, but elastic; and this is very important, for, if rigid, the knee tires in a long ride. The weight is about half that of ordinary side-saddles. Now, unnecessary weight is not only bad for the horse, but a great inconvenience in saddling, for all grooms are not tall and strong-armed; sometimes a gentleman has to saddle himself.

Hicks, of Edward-street, Portman-square, had a handsome side-saddle, with an "elastic support for the left thigh," provisionally registered. This may be useful to very stout ladies. The contrivances for riding on the off as well as near side may be useful in long marches in India or Australia and for deformed ladies, but are not often required. The same may be said of the bolts for allowing the near crutch to fall down, and save a lady the trouble of lifting her leg and habit over it in dismounting. As for the precautions against a fall in riding on a road, according to our notion, people who expect to fall ought never to mount. The plain spring stirrup has quite superseded the clumsy covered slipper.

Bridles.—The varieties in bridles may be counted in thousands. Among those exhibited were several for stopping or holding *pullers*; but if neither an ordinary double bridle, a chifney, or a double snaffle with gag, will hold a horse, the best way is to get rid of him. In the Carriage Court there was a contrivance for stopping a horse by closing his nostrils with an elastic band; not a new idea, nor, we suspect, a very useful one. The display of Brace, of Walsall, was very interesting. It consisted of the magnificently chased stirrups in gold and silver plate, spurs, bits, and other ornaments manufactured for the South American market, and particularly for Mexico and Cuba, where the horse-trappings of a cavalier of fortune will sometimes cost 1200*l.*

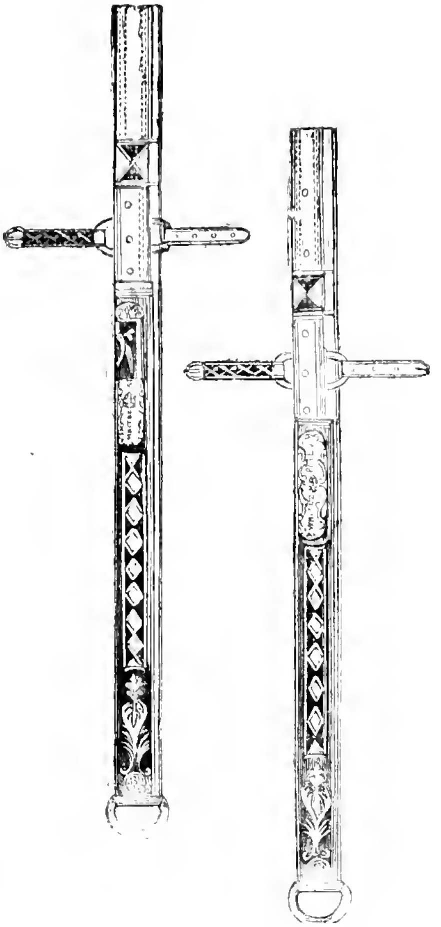
In the East Nave, opposite Tunis, was an extremely elegant white bridle, linked with silver, exhibited by Peat, Old Bond-street, "made of untanned (green) hide, made in the province of Rio Grande da Sal, Brazil, by the less civilized inhabitants." As a fancy or lady's bridle, it was a very much prettier article than anything in the English department.

Earnshaw exhibited a very magnificent blue morocco bridle, with gold ornaments, very nicely designed, which is fit for a Field-Marshal Prince, or Emperor Generalissimo. Middlemore, Birmingham, had some very handsome ladies' bridles and whips; and Ashford, of the same town, showed a bridle of caoutchouc, of neat shape, and cool neutral colour, which we fear would not wear. The same firm have an ingenious registered invention for driving-whip sockets, in which an India-rubber ring keeps the whip tight.

Harness.—A good deal of harness was shown; the leather a good colour, and well tanned, the sewing neat, but the design for the most part clumsy and tasteless. There is great room for judicious ornament in harness, but the designs seem almost stereotyped copies of ugliness. Without alluding to those which we cannot admire, we may refer to a set by Penny, of Union-street, a state pony-bridle for the Prince of Wales, designed by W. H.

Rogers; harness by Machie, of Maidenhead; and by Blyth, of Park lane, a harness pad of good workmanship and elegant design.

But decidedly the best thing in the way of improvement in harness is White's invention, by which the ugly, clumsy, inconvenient buckle of the



WHITE'S PATENT TUGS.

traces and the crupper is superseded by a hollow cylinder of leather and metal, which, when in use, lies flat: when there is any need to alter the length of the traces or crupper, a peg attached to a medal slide can be opened, the hole of the trace moves either way in a moment, instead of requiring you to struggle to unfasten the tongue of a huge buckle. The same harness, exhibited on a wooden-horse, had improved gig-harness tugs, for confining and releasing the shafts rapidly.

In cart-harness, Vick, of Gloucester, showed an excellent set made after the Scotch model, with a shifting point of draught in the collar; altogether strong, neat, and not too heavy. But still in this, as in all the Scotch cart-harness exhibited, there is too much iron-work to be kept bright for ordinary farm use. A carter ought to have enough useful work to do, without spending time in polishing harness.

A number of collars in the English and one in the Belgian department were exhibited as improvements, but of the greater number it was impossible to judge. There was an air-blown collar, which is capital in theory, because it can be blown to the requisite fit, and a good fit, no matter how heavy, never galls the shoulders; but who would venture on a journey with a collar that might be destroyed in a moment by a nail or pin? The Belgian was a very likely cart-collar, although rather too clumsy for our taste. Birmingham sent a neat straw-collar; but one of the best seemed to be one from Musselwhite, of Devizes, stuffed with cork and horse-hair, and opening at the top so as not to require forcing over the head. There is also a clever collar used in the Artillery, which was shown in the Carriage Department.

As a whole, British saddlery, either wholesale, for exportation, or retail, was very imperfectly represented.

The best point about this class is, that it has enabled our Irish and provincial saddlers to show that, at moderate prices, they can compete in utility and finish with the expensive London trade.

The foreign saddlery was for the most part an inferior imitation of English, although Paris sent some very respectable articles, except in metal-work.

We very much admired some white flax cord reins exhibited in the Belgian section. They would be just the thing for ladies, as they will wash and keep their colour.

Among the woollens on the south-side, Mr. Bliss, the cloth manufacturer, of Chipping Norton, exhibited several sets of horse-clothing of excellent quality and neat pattern. It was the father of the present manufacturer who first made the warm horse-clothing now universally used. Before his time, horse-clothing was made of the thin serge which we sometimes see on inferior horses for sale at a country fair.

We must not conclude without noticing the magnificent embroidered velvet military saddle with gold ornament, contributed by Cuff, Cockspur street (No. 96); but, splendid as it is, India and Egypt both outvie it, and there is nothing to compare with the Indian bridle of velvet and emeralds, which, although unfit for our climate and our sober costume, is admirably adapted for the country for which it was manufactured.

From saddlery and harness we are led naturally to improvements in *Hunting Costume*, of which there were two notable examples in the Exhibition. In the centre of the Nave, opposite Furs, was a case of Boots and Shoes, where Gilbert and Co., Old Bond street, exhibited a great improvement on the long black hunting boots which are so much used now in wet weather in muddy woodland counties. As ordinarily made they look extremely neat, are cleaned with a simple sponge and water in a moment, and, covering up to the middle of the thigh, are a better protection against mud and rain than any overalls. The disadvantage of this kind of boot has consisted in the wrinkles in the bend of the knee, which are often painful and always disagreeable: if the boot was loose, it flopped down; if tight, the rider was in an agony on dismounting. Messrs. Gilbert have registered an improvement, which consists in neatly introducing a piece of caoutchouc spring, covered with leather, under the knee. A gore of the same material at the top of the boot would be a further improvement. We may observe, that there are many specimens of that blessing to sportsmen of moderate means, the *Patent Leather Napoleon Boot*. Top boots, whether of the latest fashion (brown), or ancient pink tops, are all very well for the tall muscular man, with a servant at command to clean half-a-dozen pair *secundum artem*; but for dumpy figures and those happy souls with one or two horses and no servant, patent leather are a great comfort and economy. They look well, and are always ready for use. As all exhibited were good, it would be unfair to point out any in particular; but we would hint, that white stitching, and red or yellow edging to a hunting-boot, are no recommendations. Mr. Christy (Class 20, No. 35) sent a capital specimen of a new hunting-cap, of felt, which was to be seen in his case of hats in the South-east Gallery of the Transept. It would have been improved by borrowing the peak behind from Mr. Buckmaster's model helmet (No. 1) exhibited in the same class. The peak would throw off the rain, but must be neatly made, so as not to look like a coalheaver's tile. Hats are an abomination at all times, but a hat in hunting, although patronised by certain sporting critics, is an absurdity only less absurd than the bear-skins of the Foot Guards. On a windy day, in galloping through a woodland, or getting out of cover, the hat is as much trouble as the horse, gets spoiled, and sometimes lost; whilst a cap, if well made, sits close, does not catch the wind, protects the eyes from switches, the head in a fall, and is becoming to most faces. But velvet absorbs rain, and is too soon spoiled in a wet season; therefore, we hope to see Mr. Christy's felt cap patronised. Lincoln and Bennett sent hunting-caps of the same material as silk hats. We did not see any improvement in spur-fastenings, although there is plenty of room for an ingenious man. Buckles are always breaking.

WATERLOW'S AUTOGRAPHIC PRESS.—By this apparatus, any person may with facility print any number of letters, circulars, pen-and-ink sketches, musical notations, &c.; the whole machinery being compassed in a neat box not larger than a lady's writing-case. The process is as follows:—A letter is written on prepared paper, and then transferred to a polished metallic plate by hand-power, assisted by a "scraper." The paper is then washed off with water, when the writing remains on the plate, and is charged with ink from a roller. Paper is now laid on the plate, and upon the application of pressure, the impression is derived, and the process may be repeated sixty or seventy times in the hour, the plate being subjected to the ink roller for each impression. When sufficient quantities are cast off, the plate is cleaned, and ready for a fresh operation. The specimens worked are equal to lithography.

ALARM BEDSTEAD.—Mr. Savage, of Birmingham, exhibited a machine, in which, by means of a common alarum clock hung at the head of the bed, and adjusted to go off at the desired hour, the front legs of the bedstead, immediately the alarum ceases ringing, are made to fold underneath; and the sleeper, without any jerk or the slightest personal danger, is placed in the middle of the room; where, at the option of the possessor, a cold bath can be placed. The expense of this bedstead is little, if any, more than that of an ordinary one.

A MACHINE FOR TEACHING THE BLIND TO WRITE was exhibited in the Austrian department. It is of metal, of a circular form, and has round the disc the letters of the alphabet and the ten simple numerals. Within are rows of points or keys in connexion with the characters, which, on being pressed down, make an impression on the paper underneath. The person writing, soon makes himself acquainted with the position of each, by the touch; and there is some machinery on the top to guide the hand and keep it in position.

ANNOUNCEMENT.

THE Proprietors of the "CRYSTAL PALACE AND ITS CONTENTS" beg to inform their readers that a Double Number will be published on Saturday next, the 27th of March, completing the work. This Double Sheet (Price 2d), will contain Ornamental Title, Index, &c., and be embellished with a profusion of Engravings.

Having thus brought this Popular Record of the Great Exhibition of the Industry of all Nations to a termination (omitting, as they believe, no field or individual feature of importance) within a compass so moderate as to render it available to all who take a pride and interest in that important and ever memorable undertaking, they are encouraged by the extensive patronage bestowed upon their work, and the flattering encomiums passed upon the spirit in which it was conducted, to believe that a very wide field exists in which they may continue usefully to employ the talents and means at their disposal, in the promotion of the intellectual progress and general interests of their fellow men. With this conviction, they beg to announce that

On Saturday, the 3rd of April, will be published (in continuation of "THE CRYSTAL PALACE AND ITS CONTENTS"), *Price 1½d., the First Number of*

THE PEOPLE'S ILLUSTRATED JOURNAL

OF

Arts, Manufactures, Practical Science, Literature,

AND

SOCIAL ECONOMY.

PROSPECTUS.

AMONGST the important and interesting results of the Great Exhibition of 1851, has been to establish the relations between Mind and Labour upon a much more extensive and intimate footing than had ever before been supposed to exist or to be possible; — to elevate the character of the workman by giving him a taste for the beautiful in connexion with the useful—principles which, in the economy of nature, are so wondrously associated—and to extend his resources by inspiring him with an ambition to bring his peculiar industry, however humble in itself, to bear in some manner upon the highest and most honoured fields of enterprise. By such means we may hope to see the jealousies between classes and rival trades removed, and the best exertions of all uniting for the common good.

Extending our regards beyond our own shores, we see another and still more gratifying result of the Great Industrial Congress of 1851, in the conviction brought to the Productive Classes of all nations of a community of interests existing between them, superior to all interests of nationality, above all prejudices of race and birth. Thus, to sum up, we attain in the first place, increased knowledge of our own resources and of the resources of our neighbours, which, whilst it creates a just confidence in ourselves, will also create a feeling of respect for others; secondly, a recognition of the importance of the principles of reciprocal dealing, by which the peculiar advantages of one community may be interchanged for those of others; —finally, an enlarged field of commerce, and the infusion of a more liberal spirit into commercial transactions, by which commerce will grow, and with it civilisation and peace be extended as the connecting bond of the whole human family.

These new relations of Society, so happily inaugurated, are as yet without an exponent.—"THE PEOPLE'S ILLUSTRATED JOURNAL" will endeavour to fill a post so honourable and so useful. Industry, Commerce, and Intellectual and Social Progress, in their various phases of development, will be the objects to which the Conductors will devote their undivided attention, and of which they will seek to render a faithful and intelligible account from day to day, and from week to week.

The whole family of the ARTS—Arts Mechanical and Useful—Arts Decorative, and the Fine Arts, properly so called,—will come within the scope of "THE PEOPLE'S ILLUSTRATED JOURNAL." The Artisan shall have his Picture Gallery, and his Concert Room—aye, and his Theatre, to dissipate his thoughts, and extend the range of his ideas in his hours of relaxation.

In the department of MANUFACTURES, whilst those of Foreign nations will come in for a full share of notice, the "Workshops of England," inadequately represented (as is now generally admitted to have been the case) in the Great Exhibition, will be treated of with a fulness of detail, drawn from the most authentic sources, never before attempted. These Papers, when completed, will comprise a most valuable compendium of the Manufacturing, Commercial, and Industrial Resources of Great Britain in the nineteenth century. The Editor of "THE PEOPLE'S ILLUSTRATED JOURNAL" has already received much valuable and exclusive information from those personally interested and experienced in the "Workshops of England," and solicits further communications of a like kind, which will receive his best attention.

PRACTICAL SCIENCE is daily discovering and revealing new and important applications of natural products and natural affinities in the fabrication of articles of daily use. Especial attention will be paid in "THE PEOPLE'S ILLUSTRATED JOURNAL" to these discoveries, so calculated to increase the comforts of the people and extend the resources of industry.

Whilst thus more especially devoted to the Arts of Life, "THE PEOPLE'S ILLUSTRATED JOURNAL" will not neglect the Intellectual Progress of the Community, as manifested in the LITERATURE of the Age. In selecting Works for Review, and in their treatment, the Conductors will study essential features of great permanent interest, rather than the ephemeral attractions of a light and frivolous class of Literature already sufficiently ministered to by others.

The SOCIAL ECONOMY of the Industrial World will receive the anxious consideration of the Conductors of "THE PEOPLE'S ILLUSTRATED JOURNAL." The resources,—the economic arrangements,—the provident dispositions, —the homes, the hopes, the rights, and the duties of the Working Man, will all be treated of in turn, in a spirit of friendly counsel, dictated only by a sincere desire to increase the comforts, and elevate the position, of the producing millions.

Occasional ESSAYS on general subjects, Sketches of Men and Manners, and now and then a scrap of POETRY, will be introduced to add the charm of variety to "THE PEOPLE'S ILLUSTRATED JOURNAL."

With these purposes before it, and conducted with zeal and fidelity, "THE PEOPLE'S ILLUSTRATED JOURNAL," it is presumed, will occupy a new field of wide influence and utility; and the Proprietors confidently recommend it to the consideration of the intellectual portion of the community.

The ENGRAVINGS, which will be numerous, and as varied in character as the subjects treated of, will be executed in the highest style of art. The Paper will be of a very superior quality to that used for "THE CRYSTAL PALACE;" and the Typographical Arrangements of a class equal to that adopted in Publications of four times the cost; thus rendering "THE PEOPLE'S ILLUSTRATED JOURNAL" the most useful, readable, and ornamental Periodical of the day.

Note.—The Back Numbers and Parts of "THE CRYSTAL PALACE AND ITS CONTENTS" will be kept on sale until the end of April at the original cost; after which the cost of Numbers will be 2*d.*, and of Parts 1*s.*; or the whole bound in a Handsome Ornamental Wrapper, silver and blue, 5*s.*

☞ *Covers or binding Sets of the* CRYSTAL PALACE, *richly ornamented in silver and blue, may be had, Price Two Shillings.*

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The
CRYSTAL PALACE
AND ITS CONTENTS.
AN ILLUSTRATED CYCLOPÆDIA OF THE GREAT EXHIBITION OF 1851.

GROUP OF BRONZES.—VITTOZ.

ORNAMENTAL BRONZES.—VITTOZ.

Our present sheet contains several specimens of the exquisite ornamental bronzes exhibited in the French department, which we shall notice under one head.

The group of bronzes, by Vittoz, engraved above, comprised a variety of objects, as a group of Paul and Virginia, a Muse, Young Bacchanals, &c., all executed with correct spirit, and finished with the nicest artistic skill. The principal figure in the centre is that of Benvenuto Cellini. The Lamp is after a pretty model; so also is that in gold and silver, by the same producer, engraved in page 409.

The Triton and Vase, by André (pp. 408 and 409), are of very elegant design; the Triton, intended for a fountain, is remarkably spirited, and graceful in outline.

The hall stove, by Baily and Sons, which stood in the Main Western Avenue, may be pronounced a *chef-d'œuvre* of iron and brass casting; the open panels at the sides being of the latter material. Above is a marble slab, upon which stood a lamp of elegant proportions.

LOCKS AND SAFES.

ELIZABETHAN KEY. FEATHAM.

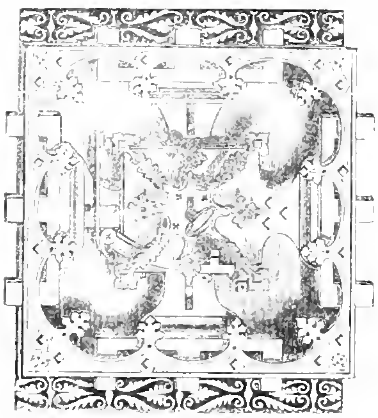
THE collection of Locks exhibited was very numerous; but we shall not be expected to detail their peculiarities.

First, were several historical illustrations of lock-making, in Roman, old French, Mediæval, and old English specimens.

A contrivance by Aubin, of Wolverhampton, contained the movements of the most celebrated locks (37 specimens), which, with their connected mechanism, contained upwards of 3000 parts, all put in motion by the arm of a lever communicating by hidden works.

Bramah's Locks were represented by the padlock, which for many years has been exhibited in the window of Messrs. Bramah's shop in Piccadilly, with a promise of 200 guineas to any artist who would make an instrument that would pick or open the lock. There were also other specimens of Bramah's locks: the principle consisting in an arrangement of slides, each with a peculiar motion, which fall into notches in a shot-bolt, and detain it there; and as each slide will do this, it ensures great security.

Messrs. Chubb contributed specimens of their Patent Detector Locks and Latches. Each lock consists of six distinct tumblers (except in the very smallest sizes), working on a centre pin; all of which require lifting to various heights by the key before the lock can be opened or shut; and not until each tumbler is lifted to its proper position can the stud, which forms a part of the bolt, pass through the slots in the tumblers. A "detector," forming the peculiar feature of Chubb's lock is added; and, in the event of either of the six tumblers being



CHUBB'S PATENT LOCK (INTERIOR).

overlifted, in an attempt to open it by a false key or picklock, one of them is caught by a detecting spring in such a manner as to render it impossible to open the lock on the application of its own key. Notice is thus given of the attempt, and the lock may be set right by turning its key in a contrary direction to that in locking.

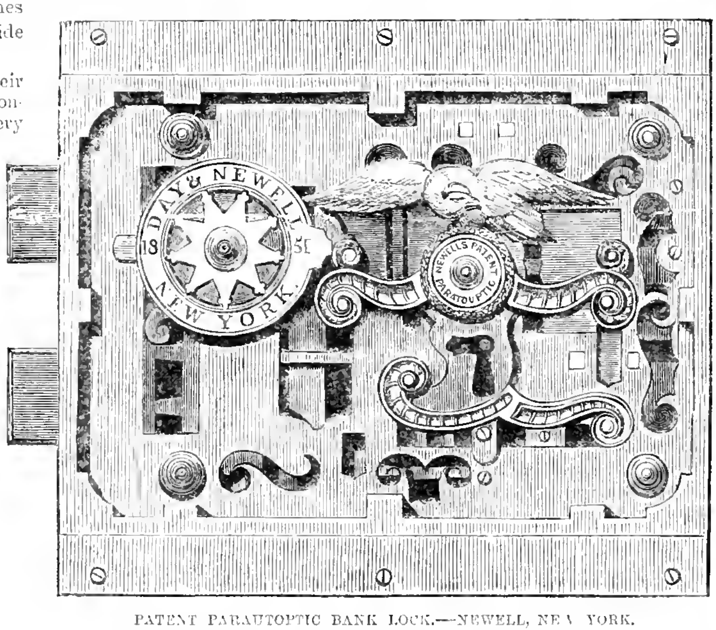
Although the locks were of various styles, Norman, Gothic, Elizabethan, &c., with appropriate steel and ormolu mountings, and richly ornamented keys.

The Patent Quadruple Lock for a banker's strong room door, consists of a combination of four separate and distinct locks in one, all being acted upon at the same time by a single key with four bits. For further security, there is a check lock in addition, throwing a hard steel plate over the large keyhole. The patent rim lock contains eighteen tumblers, with three different detectors, each acted on by six of the tumblers, and has been constructed to show the principle of Chubb's three different patents, dated 1824, 1833, and 1847.

The Patent Fireproof Banker's Safe is made of wrought iron, the iron of the body being half an inch thick at the thinnest part, and the doors 1 inch thick, the whole being lined throughout with hard steel plates to prevent drilling. To render the safe fireproof it is lined with two separate and distinct chambers, 6 inches thick, filled with dried non-conductors of heat. The interior is fitted up with drawers, cupboards, &c., in a manner suited to bankers' or merchants' uses. The folding-doors are secured by two patent detector wheel locks, throwing twenty-eight bolts out all round, and are further fitted with case-hardened iron scutcheon locks over the keyholes of the principal locks. Its dimensions are 6 feet [illegible] inches high, 4 feet wide, and [illegible] feet deep, and its weight is 3 tons 5 cwt.

Messrs. Chubb also exhibited a model of their Patent Well Safe, by means of which a safe containing any valuable property can be lowered to any distance below the surface of the ground, and secured by a fire-proof door and framework at the mouth of the well.

In the United States department was exhibited Newell's Patent Parautoptic Bank Lock, by the proprietor, Mr. A. C. Hobbs. Its most important feature is that the owner can, with the greatest facility, change the interior arrangement to a new and more complex one at any moment he pleases, simply by altering the arrangement of the bits of the key; and this is accomplished without removing the lock, or any part of it, from its position on the door. Its operation is as follows:—At the closing or locking of the lock, whilst the bolt is projecting, the moveable combination parts assume precisely the position prescribed to them by the key, according to the particular arrangement of its bits at the time the key is turned. The combination parts do not consist in one set of tumblers only, such as are found in most other locks, but there are three distinct sets or component parts, fitting into each other. When the bolt is projected, it dissolves the mutual connexion of the constituent pieces, and carries along with it such as are designedly attached to it, and which assume the particular positions given them by the key in its revolution. These parts are rendered permanent in their given form by means of a lever adapted for the purpose, while the parts not united with the bolt



PATENT PARAUTOPTIC BANK LOCK.—NEWELL, NEW YORK.

are pressed down by their springs to their original places. If now the bolt is to be returned again—in other words, if the lock is to be unlocked—the constituent pieces, or tumblers, which are in their original state, must, by means of the key, be again raised into that position in which they were when the lock was closed; otherwise, the constituent parts attached to the bolt would not lock in with the former, and the bolt could not be returned. Nothing, therefore, but the precise key which had locked the lock can effect the object. This lock is said to have another peculiar feature, one of considerable value, that it will withstand the action of gunpowder.

One of the results of the Exhibition has been the picking of a lock of Chubb's make, and Bramah's Padlock, by Mr. Hobbs. A long controversy ensued as to the actual compliance with the conditions of picking: the case of Messrs. Bramah was referred to a Committee of arbitrators, who, having witnessed certain experiments, decided that Mr. Hobbs had picked the lock without injuring it, and Messrs. Bramah accordingly paid him the 200 guineas; though he had used three or four instruments, instead of one, stated in the challenge.

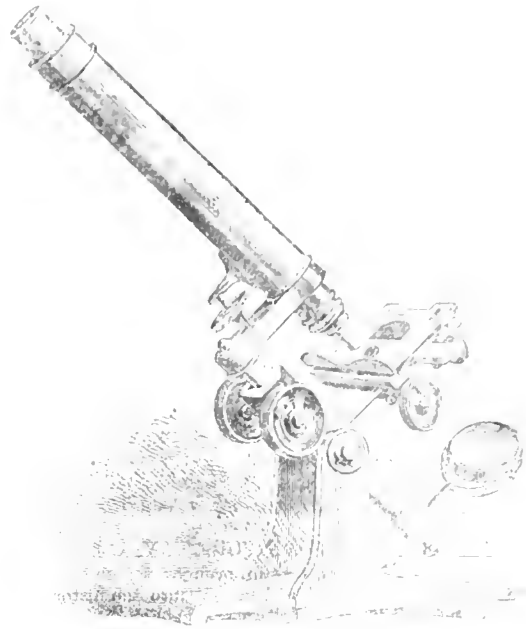
The Safe for the Koh-i-noor Diamond, the work of Messrs. Chubb, may be described here. It consists, first, of an octagon table, the top and sides of half-inch wrought-iron plates, riveted together with angle-iron. In the interior is a fire-proof safe, 12 inches square, and 2 feet 9 inches deep, the wrought plates being 1 inch thick. In the centre of the safe is a platform, 9 inches square, on which the velvet cushion, jewels, and setting are fixed. A hole is cut out of the table to allow the platform to descend into the safe. In order to secure the diamonds at night, a small door, 3 inches square, in one of the panels of the table, was unlocked, and, by turning a winch, the platform gradually sank into the safe, and a sliding iron door was drawn over the opening at the top. The cage was secured to the table by [illegible] pieces at the bottom ring dropping into corresponding holes, and these were locked by two separate detective locks; the keys of these locks were held by the crown officers; and without them

access to the jewels could not be had. The key of the small door allowed the platform to be raised or lowered only, but did not give access to the jewels. The weight of the whole was 36 cwt., and it was bolted to the floor.

PHILOSOPHICAL INSTRUMENTS.

LADD'S IMPROVED MICROSCOPE ADJUSTMENTS.

WE present our readers with a view of the microscope, No. 486, for which the inventor, Mr. Ladd, of Walworth, has received honourable mention from the jury of Class X. No person who has used the microscope can have failed to experience the difficulty which in all ordinary instruments prevents the nicety of adjustment essential to microscopic observation. This arises from the motion of the tube depending upon a rack and pinion, which, from their nature, it is scarcely possible to make to work with smoothness and accuracy; and even in the best instruments the parts are speedily worn, producing that unsteady motion known as "loss of time." The inventor has overcome this objection by employing a steel fusee chain in lieu of the rack, and substituting a steel pin or axis for the pinion; the chain, passing two or three times round the axis, is attached at each end of the sliding bar supporting the body of the microscope; the axis, furnished with a milled head, is made to revolve as in the rack and pinion, of course carrying the tube with it. Similar movements are applied by the inventor to the moveable stages, superseding the [illegible] thus obtaining an equal rate of motion [illegible] less space. These improvements, [illegible]

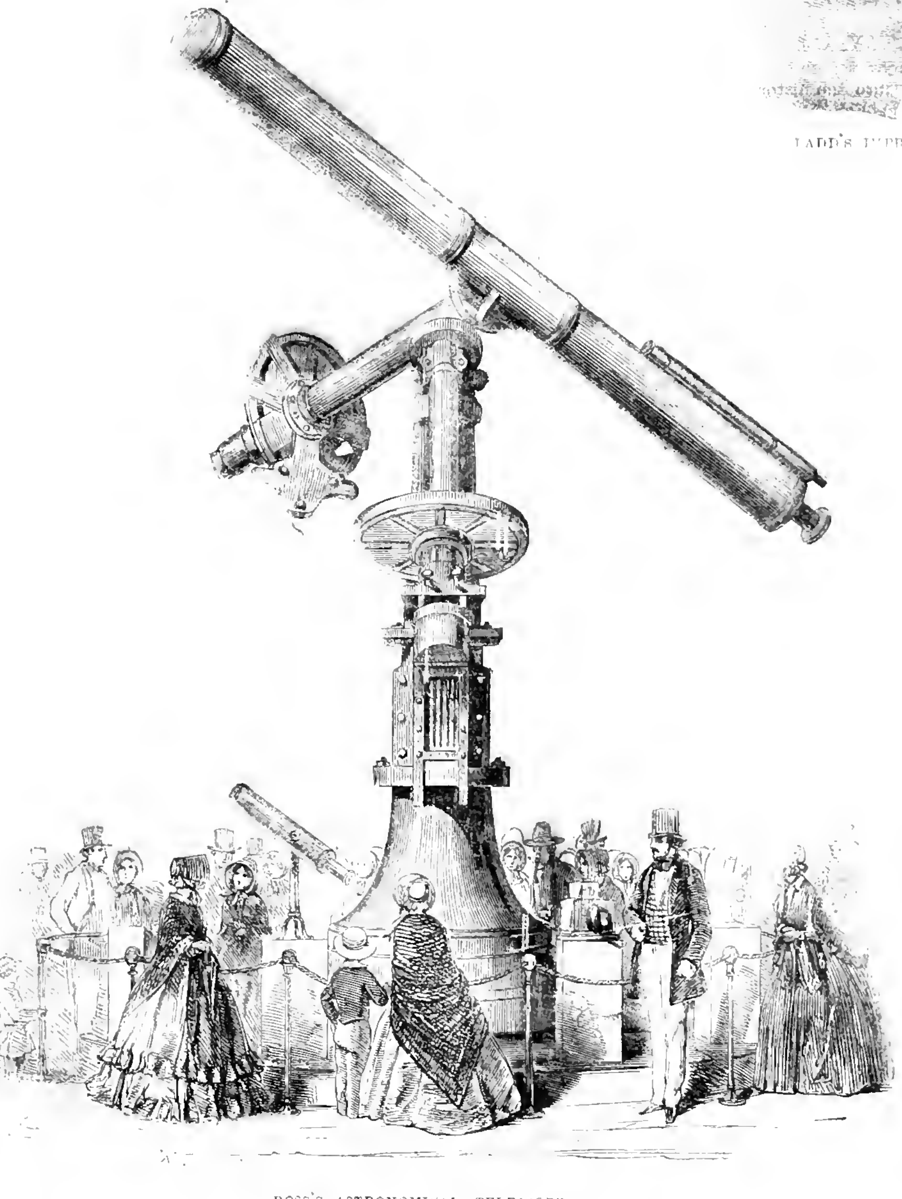


LADD'S IMPROVED MICROSCOPE ADJUSTMENTS.

unnecessary in most instances the supplementary "fine adjustment," will afford a uniform steady motion without the possibility of loss of time, while the friction is so slight that the wear of years will not be perceived; thus reducing the cost of this valuable instrument, so necessary to the investigation of every branch of the physical sciences.

ROSS'S ASTRONOMICAL TELESCOPE.

THIS very fine instrument occupied a conspicuous position in the Central Avenue of the Western Nave. The tube is 20 feet in length, and the object-glass 11½ inches in diameter. It is mounted upon a stand with equatorial movements and complete adjustment. The optical part is wrought by Ross's improved system and machinery. A note in the "Official Illustrated Catalogue" states:—"The grinding of an object-glass of 11½ inches in diameter to a good figure, and free from both spherical and chromatic aberration, is very difficult. The advantage of a large object-glass will be seen from the following consideration. The principal reason of the superior distinctness of a telescope over unassisted vision arises from the fact that the pupil of the eye takes in a certain number of rays of light; but on looking through a telescope it takes in as many more rays in proportion as the object-glass is larger than the pupil itself, and the object appears as brilliant as it would were the pupil of the eye to be enlarged to the size of the object-glass."



ROSS'S ASTRONOMICAL TELESCOPE.

SNUFF BOX IN IRISH BOG OAK.

WATERHOUSE.

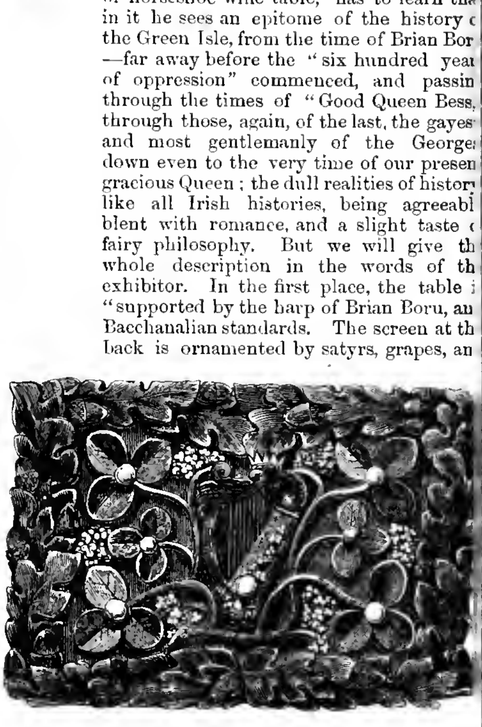
THE snuff-box in Irish Bog Oak, exhibited by Waterhouse, of Dublin, is an extremely fine specimen of carving. The Irish Harp is in the centre, surrounded by shamrocks and oak leaves.

IRISH BOG YEW FURNITURE.—JONES, OF DUBLIN.

BOG YEW FURNITURE. BY A. J. JONES, OF DUBLIN.

JONES, of Stephen's Green, Dublin, brought together a very extensive series of decorative furniture in Irish bog yew, designed to illustrate the history, antiquities, animal and vegetable productions, and other national features and peculiarities of the sister isle. The intention is highly creditable to his spirit of patriotism; and the talent bestowed upon the various objects is of a character to warrant the belief that the Irish artificer only wants encouragement, to enable him to take a position of honourable rivalry with those of any other European nation. The devices are varied and striking, and the execution, in most of the details, at once bold and careful. It is to be regretted, however, that in most cases the subjects have not been better chosen, being often extravagant and inappropriate. We will refer, for instance, to an arm chair, the arms of which are impersonated by dogs, the one lying down, the other half standing. Can anything be conceived less inviting, or less comfortable? The chair and card-table which we engrave at the top of this page, bein less ambitious in style, are generally com mendable as handsome and serviceabl pieces of furniture.

The wine table (engraved at the foot c the page) has a long story attached to i regardless of the maxim, "Least sai soonest mended," which is a sound maxir and one which, considering art to be a sor of language, we would commend to all wh resort to it for decorative purposes. Th guest who sits down to this "semicircula or horseshoe wine table," has to learn tha in it he sees an epitome of the history c the Green Isle, from the time of Brian Bor —far away before the "six hundred yea of oppression" commenced, and passin through the times of "Good Queen Bess, through those, again, of the last, the gaye and most gentlemanly of the George down even to the very time of our presen gracious Queen; the dull realities of histor like all Irish histories, being agreeabl blent with romance, and a slight taste c fairy philosophy. But we will give th whole description in the words of th exhibitor. In the first place, the table i "supported by the harp of Brian Boru, an Bacchanalian standards. The screen at th back is ornamented by satyrs, grapes, an



SNUFF BOX OF IRISH BOG OAK.

foliage, vases of fruit, and the badges of th three principal orders of knighthood, th Prince of Wales's plume in the centre, and th St. George conspicuous above. In the centr of the screen is an historic sculpture in higl relief, representing the punishment of inhos pitality, or the abduction of the youn St. Lawrence, heir of Howth, by Granuwaile the Irish princess, on her landing at Howth when returning to Ireland from th Court of Queen Elizabeth. Granuwail having landed, proceeded to the castle fo refreshment, when the gates were closed and the gate-keeper informed her the famil were at dinner, and no person could be ad mitted. Retiring in disgust and irritation and proceeding to the shore, she met with a child in care of attendants, who, on inquiry proved to be the young heir of Howth; sh immediately ordered her attendants to seiz the boy: a sturdy sailor conveys him to th boat at the stern command of Granuwaile; the female attendants are in grief and dismay; the young heir was conveyed away to the west of Ireland, and not restored for fifteen years; and then only on condition that the gates of Howth Castle shall never be closed at the dinner-hour—a condition which is fulfilled to this day. The scene of this remarkable transaction is laid at the old landing-place of Howth, the spot where it actually occurred, and the point of view selected is where the late King George IV. first set foot on Irish ground. The hill of Howth forms the back-ground; Lord Howth's castle being on the right of the spectator. The leading

[illegible]ABLE [illegible] IRISH BOG YEW.—JONES, OF DUBLIN.

jects on the acclivity of the hill, and the ins of the old abbey church, are shown. retching out to the left, Ireland's e, with its conspicuous and pic-resque craggy cliffs, is depicted from ture. Around this picture, forming ort of frame, are objects in keeping th marine scenery, shell-work, coral, ning apparatus, &c. From the centre the screen projects an ornate rotatory ister, composed of rich clusters of pes and foliage, and traverses the ler semicircle of the table. Arising m the coasters are two aërial figures, Irish fairy man and woman, sup-rting an ancient Irish meather, and nting to the national motto inscribed roon, *Cead mille failte*, 'A hundred usand welcomes.' The ancient Irish ertained a strong superstitious belief l reverence of 'Fairies,' or 'Good ople,' attributing virtues and vices, h their corresponding rewards and nishments, to their influence; so t every propensity, whether bad or od, resulted from their enchantment. *y are represented on the coaster as rcising their bewitching power to tempt lovers of the 'pure blood of the grape' xceed due bounds.* In this period of ir progress they appear in celestial ms and with captivating smiles; but, *ving accomplished their purpose, they capable of assuming the most malig-t and hideous aspects, and inflicting dly punishments.*" A long story, ly, by way of prelude to a glass of ie; and one which would surely e a relish to the generous grape but the concluding portion, which, ler the circumstances, sounds a le uncalled-for, not to say unkind. he designer had any *arrière pensée* of ing the host's wine (as an induce-nt to purchase this particular table), should pronounce the proceedings itively "shabby!"

LL DECORATION IN STEVENS' MARTIN'S CEMENT.

s chaste and elegant piece of work, n the designs of J. T. Knowles, Esq., intended to show the various pur-es to which the above cement can pplied. A minute examination con-es one of the great beauty of the cle in its pure white state, as used the architectural enrichments of ms, while some portions of the design nonstrate its excellence in the shape scagliola work; and others show well suited it is for painting and ling upon, which processes can be formed in a few hours after the ent is put up. This material is proof, and susceptible of the highest ish.

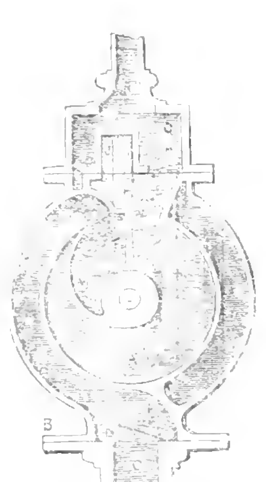
IODEL PAVING.—This consists of ken stone, inserted between blocks wood; driven hard on to the wood he bottom of a groove, which is first have placed therein a composition gravel and ground lime, and a por-of the same brushed over the sur-to fill up the vacancies that may eft, after which a thin layer of gravel id over the surface.

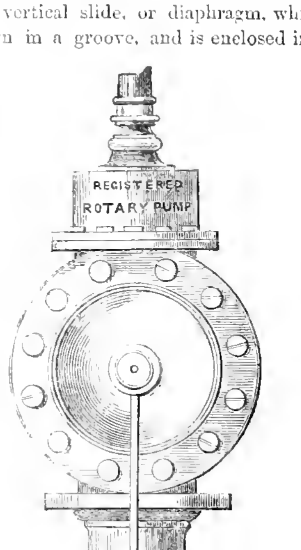
WALL DECORATION IN STEVENS' MARTIN'S CEMENT.

MACHINERY AND MECHANICAL CONTRIVANCES.

CLUNE'S ROTARY PUMP.

AMONGST the many contrivances of this class in the great Exhibition, Mr. Clune's a ... attracts ... notice, from the simplicity of its construction, portability, and neatness of design. It may be either placed ... attached to a wall, or be fixed on the top of a pedestal or column. The cylinder is placed horizontally, its axis projecting through the front of the case to a handle, by which motion is communicated to it. The cylinder, having a flange at bottom, is secured by means of bolts to the top flange of the supply-pipe, at the top of which pipe is the clack valve in a curved chamber at the bottom of the cylinder, which leads into the external channel, passing half round the cylinder, and terminating in a port at top. Behind this port is a vertical slide, or diaphragm, which acts as a stop, and slides up and down in a groove, and is enclosed in a





case above the cylinder, its lower edge being faced with leather, caoutchouc, or other suitable substances. For the greater part of the revolution of the horizontal shaft of the pump, the stop rests upon a cylindrical boss surrounding the shaft, which passes through one side of the cylinder by means of a stuffing-box, its opposite end resting on a fixed bearing on the other side of the cylinder. The boss is cast with an excentric or spiral cam the outer end of which works in contact with the interior surface of the cylinder, whereas its sides are in contact with the ends of the cylinder. In front of the vertical slide is the delivery-port, with its valve opening out at the top of the cylinder, having a discharge-pipe for the water or other fluid to be pumped up. At each revolution of the cam, which causes the stop or diaphragm to fall, a vacuum is formed behind it, after passing the inlet-port already described, and thus a body of water is at once elevated to the cylinder through the lower valve, at the same time the water already in the cylinder in front of the excentric is driven out through the upper clack-valve. The action of the gradually-curved cam effects a smooth and easy action on the diaphragm, and a regular discharge of the fluid is secured by the rapid rotation of the cam.

COINING-PRESSES.

MAUDSLAY'S COINING PRESS.—This beautiful machine is worked by a double-cylinder direct-acting high-pressure engine, on the shaft of which is a metallic pulley of 36 inches, and a fly-wheel of 72 inches diameter, respectively. The cylinders are each of 5 inches diameter, and the length of the stroke 16 inches. From the pulley of the engine, a strong double leather strap passes to a drum of 56 inches diameter on the main shaft of the press, by which motion is given to the cross-head and other parts of the machine; this drum being attached to the engine fly-wheel, of 64 inches diameter. In coining-presses, as ordinarily used, either a screw or lever is employed to give motion to that part of the machine by which the necessary impressions are given to the metallic *blank;* but in the present instance, this motion is obtained by means of an excentric, by which a pressure is brought into action of 140 tons: the cross-head, worked by the excentric, which is concealed from view, having an alternate vertical motion of three-quarters of an inch. Underneath, and attached to the cross-head, are two collars, the lower one of which contains the upper die; while the lower die is contained in a collar, which is kept up by three radially-placed springs pressing thereon, and forms the temporary resting-place for the blank undergoing the process of stamping. At proper intervals, the collar is pressed down by two small levers or arms, having an alternate motion. The blanks, twenty-eight in number, each of nearly one-eighth of an inch in thickness, are placed in a circular brass hopper, from an opening in the bottom of which they are successively transferred to the lower die by means of a split curved arm, or tongs of ingenious construction, having two fingers at the end, by which the blank is held during its transference from the hopper to the lower die, when the curved arm is opened so as to release the die: the distance between the centre of the hopper and the centre of the die is 5 inches. The opening and shutting of the split-arm, or tongs is effected by a vertical pin moving in a short slot formed in the stem of the curved delivery arm; this pin is attached to the end of a second horizontal arm or lever, which is worked by a vertical spindle in connexion with an elliptical cam towards the top and front of the press. In case of a blank being larger than that of the required gauge, a safety spring is attached to the second horizontal arm already mentioned, having its centre of motion on the vertical spindle, by which the error is detected. By this press, 60 double impressions are thrown off in a minute.

GERMAN COINING PRESS.—Among the contributions to the Exhibition from Cologne was a coining-press, on the principle of the knuckle-joint which, coining at the rate of from thirty to forty a minute, completes the coin and *mills the edge in letters at one motion.* By Maudslay's coining-press above described, the coins are silently and successively stamped, pushed off, and replaced by another blank disc, in a manner that seemed, until we examined the German press, the perfection of art. But the milling the edge with letters by the motion which forms the die, has not hitherto been effected by English machine-makers.

PAPER-MILL.

IN the French department was exhibited Middleton and Elwell's paper-mill. At one extremity is an endless band of wire gauze of the required width which passes round rollers; on this the pulp is allowed to flow; the thickness of the paper being regulated according to the flow of the pulp, or to the speed at which the wire gauze is driven. As the pulp is carried along by the gauze, the water percolates; sometimes a jogging motion is given to the gauze more effectually to set the pulp, which having acquired a certain degree of consistency, just sufficient to bear being removed, it passes on to a long jack-towel, if we may so term it, which absorbs the moisture more effectually; the pulp thus travels on, gradually acquiring a greater degree of consistency, till it passes over three cylinders heated by steam, each cylinder increasing in temperature; the paper is then made, and is cut longitudinally and transversely into any sized sheets. All this is done by the same machine.

LATHES AND TOOLS.

SHARP Brothers and Co., of Manchester, contributed some good examples of lathes for turning the wheels of locomotive engines and other purposes. The first of these is called a Railway Wheel-turning Lathe, having two face-plates each of 7 feet diameter, adapted for turning a pair either of locomotive or railway carriage wheels of that size, when fixed upon their axle or otherwise, without torsion. Two tires may be bored at the same time, or a wheel may be turned on one plate whilst the boring or bossing of a second wheel is going on, being attached to the other face-plate. The extreme distance between the centres of this lathe is 9 feet 6 inches, so that axles and wheels of the broadest gauge may be turned in it. The advantages of this machine are, that the two tools employed have self-acting motions, whereby one man is enabled to accomplish more than twice the amount of work by lathes of the ordinary description.

The second machine was that used for cutting the key-grooves in the bosses of railway and other wheels, up to any diameter not exceeding 7 feet; having also longitudinal, transverse, and circular self-acting motions.

The third was a machine for planing articles of metal; the article being moved along by a traversing table, while the cutting tool is attached to a cross slide, and so arranged that the machine itself, having been once put in motion, causes the tool to cut either horizontally, vertically, or at any required angle, without the assistance of an attendant.

Next was a horizontal shaping and planing machine, differing from the previous one, in the tool moving while the article operated on is stationary. Horizontal and circular work is effected by self-acting movements of the machine; while irregular curves are planed by a motion requiring the attention and direction of the workman.

Holtzapffel and Co. exhibited some of their machines and tools adapted to ornamental turning, specimens of which were also displayed. There was a lathe with a new and rather complicated rest; its chief peculiarity being that it enables spheres to be turned with greater precision than hitherto. There were also the geometrical, excentric, and oval chucks. In this class of instruments the tools, made of every variety of form, revolve, while the work under operation remains stationary; being the opposite conditions to those usually observed in ordinary and rose-engine turning. In some instances a still larger amount of elaborate work is produced by putting both the work and the tool in motion at the same time. There was also a valuable rose-engine, very completely fitted with a variety of apparatus, such as a compound sliding rest, segment engine, oblique motion, excentric, oval, straight line, spherical, geometric, and many other chucks; which are employed either independently or in combination with each other, with or without the rose-engine movement, which in itself is a prolific source of elegant embellishment.

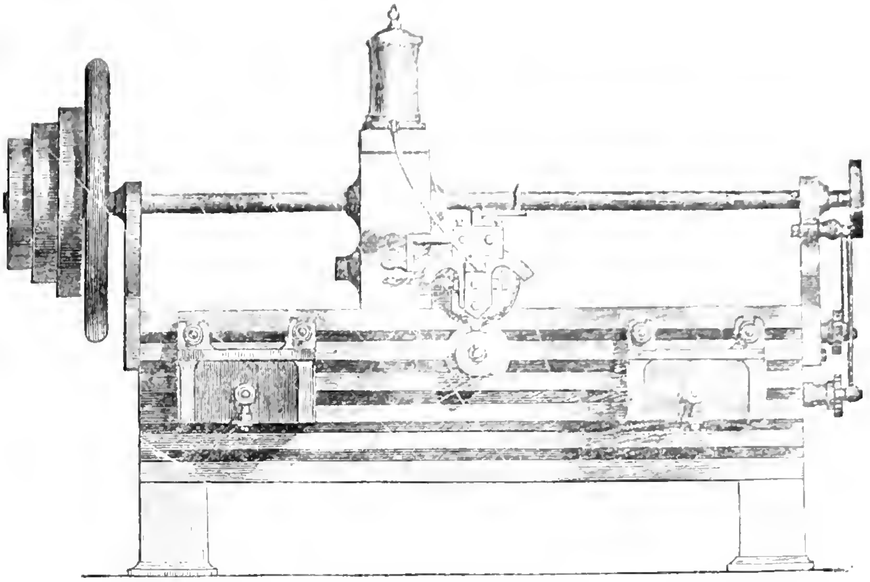
Whitworth and Co. contributed a complete series of their beautifully finished self-acting lathes; as also their planing, slotting, drilling, boring, screwing, cutting, dividing, punching, and shearing machines, respectively. Most of these machines were seen daily in action in connexion with a steam-engine.

Parr and Co. exhibited a general shaping machine, used for cutting out and forming hollows in metals to half an inch in radius. Its novelty consists in the introduction of a pair of excentric wheels, which give motion to the crank, thus effecting a more uniform motion.

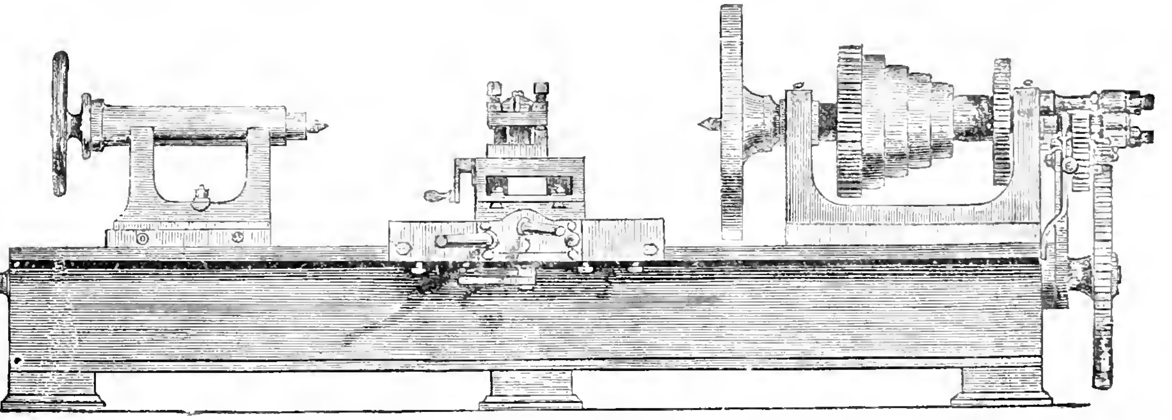
Next was Parr and Co's machine for drilling holes in metal, up to $1\frac{1}{2}$ inch diameter. It is supplied with a self acting feed motion; the pressure being regulated either by a friction-brake or by the operator. Parr and Co. also exhibited their slide and screw-cutting lathe—fitted with geared head-stocks, having a conical mandril, and case-hardened steel bearings and collar. The guide-screw extends the whole length of the machine, and the compound slide rest is self-acting, both longitudinally and transversely: motion being given to the machine by steam.

Shepherd and Co. contributed a self-acting lathe and screw-cutting apparatus, self-acting surface motion, and improved disengaging motion, remarkable for superior finish.

It has been well observed of this department, that "if we find but little novelty, there is much to excite admiration for the perfection of its execution and the magnificent scale of its operation. Thus, we have a lathe which turns a shaft nearly forty feet in length, and another which turns the tire of a wheel eight feet in diameter, both being driven by steam." The planing machine exhibited by this firm operates upon metal as successfully as wood is planed by the carpenter. The first illustration shows the elevation of this machine. On the left is a multiplying pulley, by which, in connection with a band or strap from a steam engine, the motion of the machine is accelerated or retarded at pleasure, merely by shifting the strap from one step in the pulley to another. It is self-acting, both as regards metallic forms to be cut either vertically, horizontally, or angularly; it is simple in its several parts, and is evidently constructed with a view to strength. The second illustration is an elevation of one side of the "slide and cutting lathes" of the same firm. It will be seen that the main parts of this machine have a solid appearance, particularly the bed on which the whole is fixed. It is fitted with geared head stocks, having a conical mandril, and case-hardened steel bearings and collar. The guide screw extends the whole length of the machine, and the compound slide rest is self-acting, both longitudinally and transversely. Motion [illegible] the machine by the same means as in the case of the planing [illegible] on the right hand side of the cut. The effects of a [illegible] machine (Hick and Son's hydraulic press) are exhibited, by [illegible] punch eight inches in diameter was passed through a plate of iron four inches thick, with as little apparent effort as though it passed through the same thickness of cheeses, although to effect this a force of 2500 tons is required."



PARR, CURTIS, AND MADELEY'S PLANING MACHINE.



PARR, CURTIS, AND MADELEY'S SLIDE AND CUTTING LATHE.

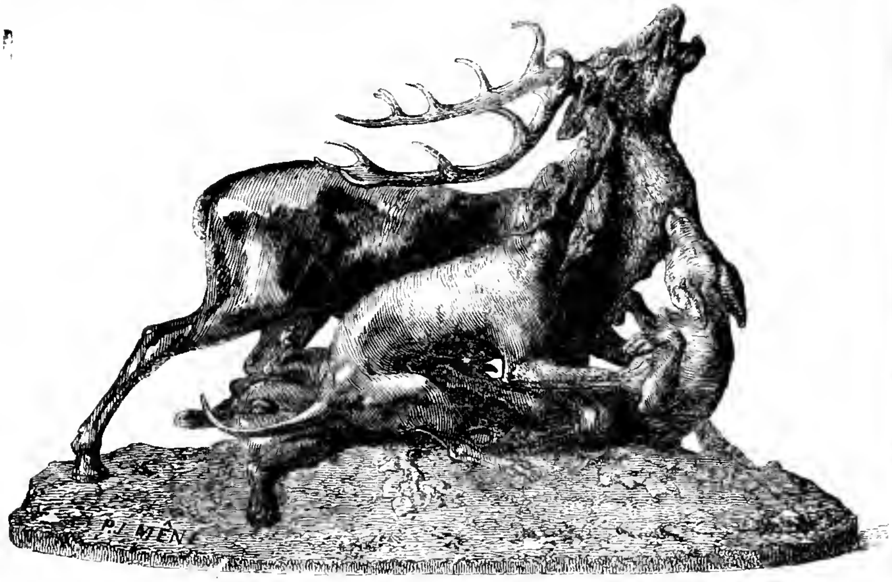
WOOD CARVING, "SPRING."—BY WALLIS, OF LOUTH.

THIS magnificent group of spring birds and flowers we have commented upon in a former notice of "Wood Carving in the Great Exhibition." For truthfulness of character, variety of objects and delicacy of workmanship it was perhaps without a rival in the Exhibition. In the opinion of many, a greater variety of size in the objects represented would have improved the group; but, embodying the characteristics of spring when only flowers are to be met with, the artist was prevented from availing himself of the varied forms which the introduction of fruit would have placed at his disposal.

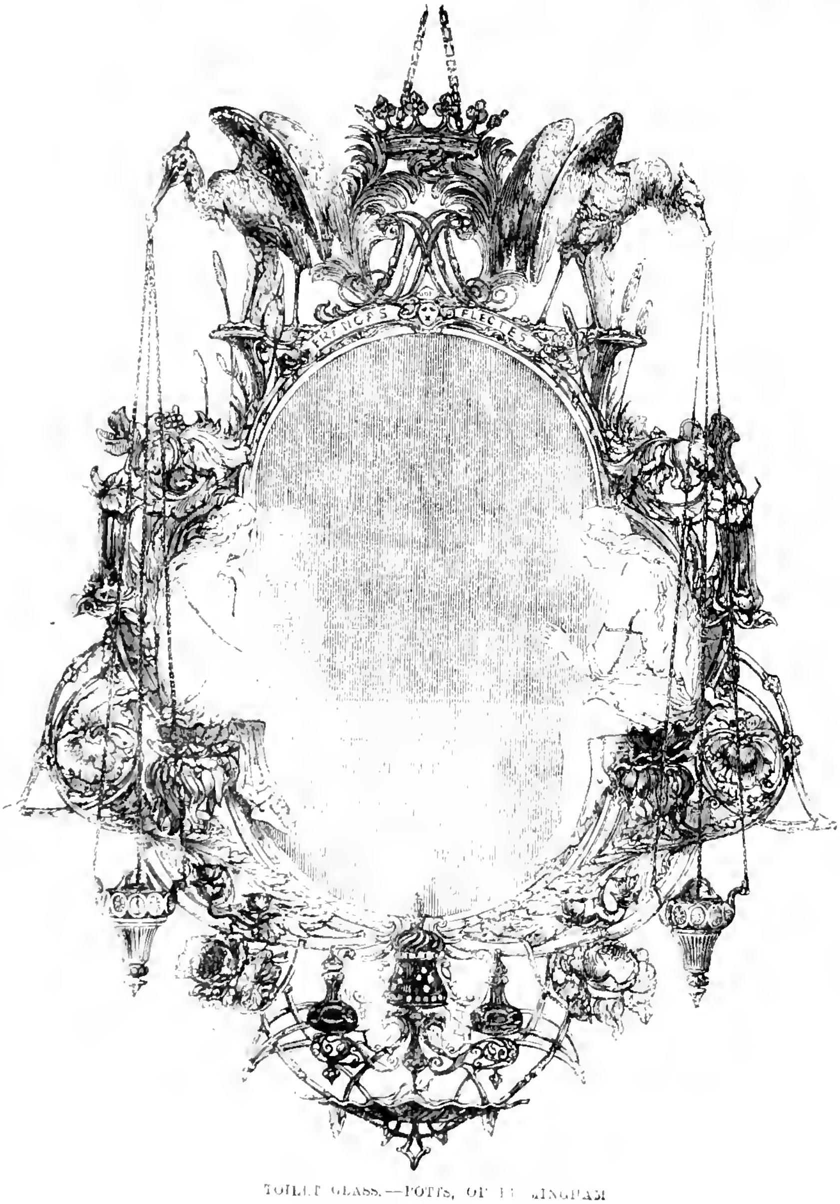
TOILET GLASS, MADE FOR HER GRACE THE DUCHESS OF SUTHERLAND.
BY W. POTTS, BIRMINGHAM.

WE believe this toilet-glass is one of the largest pieces of ornamental casting in bronze of this *genre* executed in England. Its design and workmanship reflect the highest credit on its spirited manufacturer. The idea evidently sought to be carried out is, a couple of Nereïds, sitting on marine plants, arranging their toilet. The upper part of the frame is enriched with the monogram, motto, and coronet of the noble Lady. Two herons also grace the top, holding in their beaks chains, whence are pendant *[illegible]* of elegant form. Springing from foliage of the lower part of the design are two pairs of branches for wax lights, partaking of the same [illegible] character; between these, supported on very elegant scroll-work, are three perfume bottles of cut glass. The figures of the Nereïds are of Parian.

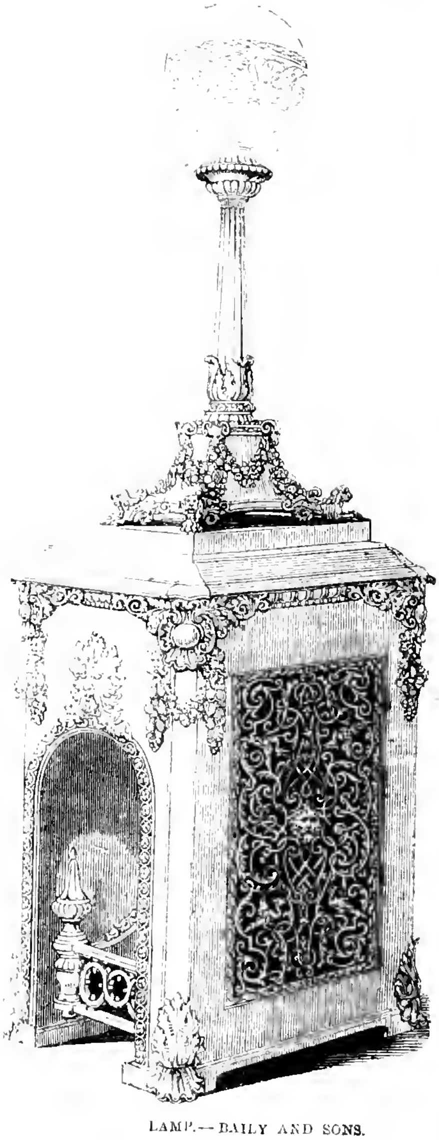
TRITON FIGURE.—ANDRÉ



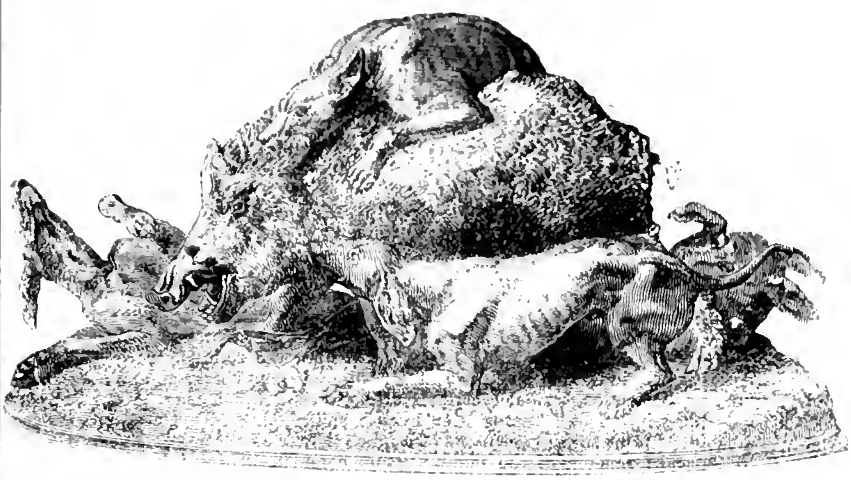
BRONZE.—MENE.



TOILET GLASS.—POTTS, OF BIRMINGHAM

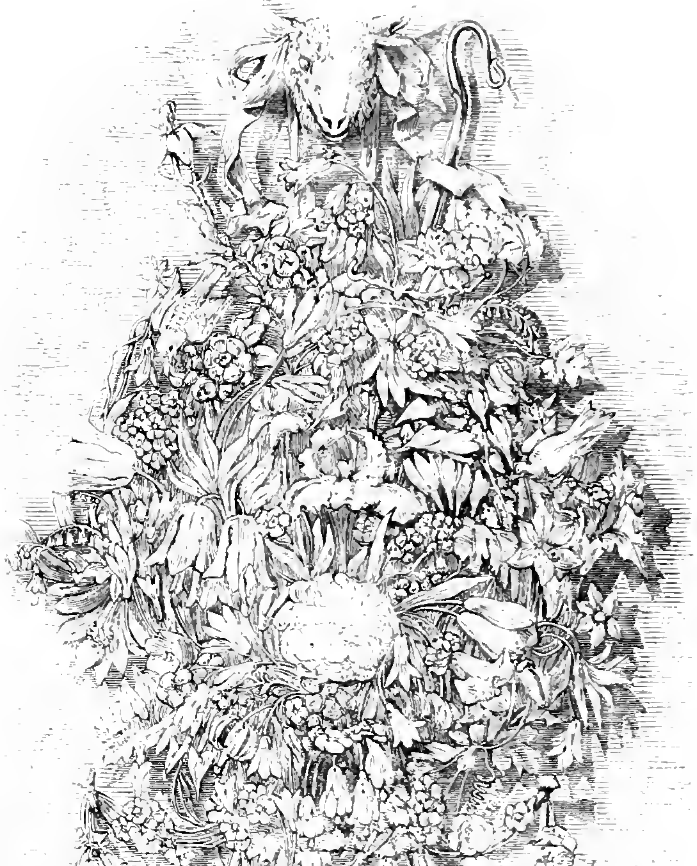


LAMP.—BAILY AND SONS.



BRONZE.—MENE.

LAMP IN GOLD AND SILVER.—M. VITTOZ.



SPRING FLOWERS.—WOOD CARVING.—WALLIS.

CRYSTALLISED ACIDS.

Among the numerous crystallised bodies which were exhibited in this section. none were more important than the various and very beautiful specimens of crystallised organic acids. Of these substances one of the most striking, both on account of the size and the perfect limpidity of its crystals, is tartaric acid, which is extensively prepared from crude tartrate of potash, and is chiefly employed by the dyers of cotton fabrics, in the preparation of their colours.

Argols, or tartar, from which this acid is manufactured, is the crude bitartrate of potash, which exists in the juice of the grape, and is deposited by wines in their fermenting vats, in proportion as the alcohol is formed, in consequence of its insolubility in that liquid. There are two kinds of tartars known in commerce—the white and the red; the former, which is of a pale pinkish colour, is the crust which falls during the fermentation of white wines; the second is a dark red substance, and is deposited by the red wines under similar circumstances. This salt, after being purified by repeated boilings with white argillaceous clay, becomes perfectly white, and is then known in commerce under the name of cream of tartar, in which form it is much employed by dyers and calico printers.

To make tartaric acid, crude tartar, or argols, is from its cheapness alone employed, and on an average it contains from 69 to 71 per cent. of this substance in a crystalline state.

The manufacture of this article is carried on to a considerable extent in the neighbourhood of the metropolis, and is conducted in the following way. Into a large tub, capable of containing three or four thousand gallons of water, is thrown from 16 to 18 cwt. of finely washed chalk (carbonate of lime), which is agitated by means of a moveable arm worked by machinery, until it has become incorporated with the water, and forms a sort of milky fluid. The mixture is now heated to the boiling point by the aid of steam, which is introduced into it through proper pipes, and the tartar is afterwards added to it by degrees, and well stirred during the whole time by the instrument before described. By this means the tartar is made to yield to the lime exactly one half of its tartaric acid, tartrate of lime being deposited with evolution of carbonic acid gas, whilst neutral tartrate of potash remains in solution. To decompose this second atom, and separate from its base the portion of tartaric acid still united to potash, a proper amount of sulphate of lime, obtained from a subsequent operation, is added to the mixture, which, on being again heated and stirred, will be found to consist of insoluble tarcatrate of lime, deposited at the bottom of the tun, together with a solution of sulphate of potash which is drawn off and evaporated in proper vessels, in order to obtain that salt in a crystallised and marketable form.

The tartrate of lime remaining at the bottom of the tun is now well washed with pure water, and when judged sufficiently clean is decomposed by the addition of a sufficient amount of dilute sulphuric acid, into free tartaric acid (which is held in solution by the water) and insoluble sulphate of lime or gypsum, which soon settles at the bottom of the vessel in which the decomposition is effected. To separate the solution of tartaric acid from the insoluble gypsum with which it is associated, a system of filtration on a large scale is had recourse to; the clear liquor which passes through being pumped into large evaporators, whilst the solid sulphate of lime is reserved to produce the decomposition of neutral tartrate of potash in the succeeding operation. The vessels in which the weak tartaric acid liquors are evaporated down are commonly made of wood, lined with sheet lead, and the heat is usually obtained by passing through the liquid coils of leaden pipes, through which a current of steam, at a considerable pressure, is made to pass.

The liquors, after being concentrated to the proper point, are now run off into large leaden tubs, where crystals of crude or rough acid are quickly formed. These are subsequently redissolved, and the solution is filtered through a layer of animal charcoal, for the purpose of removing the brown tint caused by the extractive matter contained in the argols. By successive crystallisations and filtrations the acid is in this way made to assume a great degree of transparency, and when crystallised from solutions which are not too highly saturated, the finest specimens are obtained. We observed some very beautiful crystals of this substance in the case of Messrs. Pontifex and Wood, and some extremely pure specimens of the same acid among the collections belonging to Messrs. Howard and Kent, of Stratford, and Messrs. Huskisson, of Gray's-inn-road.

Citric acid—fine examples of which were exposed by the exhibitors above named—is manufactured from the concentrated juice of the lemon or lime, and is used both for the preparation of cooling drinks, and also by the dyers of silk and calico. The methods by which this acid is obtained from the imported lime juice very closely resemble those employed in the manufacture of tartaric acid. It is, however, far more expensive than tartaric acid, and is consequently sometimes adulterated by the cheaper article. This adulteration is easily discovered by the addition of a little carbonate of potash to the suspected acid; for if tartaric acid be present, a precipitate of cream of tartar will quickly take place, particularly on stirring with a glass rod—whilst if pure citric acid be thus treated, no sort of deposit will be produced. This acid sells at about 2*s.* 6*d.* per lb., whilst the cost of tartaric is but 11*d.* per lb. Among the salts of this acid which were exhibited, we may notice a specimen of effervescent citrate of magnesia, by Mr. W. King, of Soho-street, Liverpool.

Among the numerous preparations exhibited by J. F. Macfarlane & Co., of Edinburgh, and Mr. Button, of Holborn-bars, London, were some large and extremely beautiful specimens of gallic acid. This substance is prepared from the gall-nut, and is employed in photography, for the production of galtronitrate of silver.

Gallic acid may be obtained by mixing powdered galls with water, and exposing the paste for some weeks to the air, at a temperature of about 70° Fahrenheit, and occasionally adding a little water to prevent the mixture from becoming dry. The powder thus treated gradually swells, and becomes mouldy, and on subjecting the magma to pressure, a quantity of dark-coloured liquor is easily squeezed out; the residue, or cake, is now boiled in water, and the solution filtered whilst hot; and on cooling, it deposits long acicular crystals of gallic acid, which may be purified by re-solution and boiling with a little animal charcoal. On again crystallising this solution, crystals of a much lighter colour are obtained. Gallic acid forms one of the ingredients of common writing ink, the colouring matter of which consists of a mixture of gallate and tannate of iron.

In the case of Mr. J. Fowler, of Bedford-street, Covent-garden, was a beautiful specimen of pure benzoic acid—a substance obtained either by sublimation, or in the humid way by the action of bases on gum benzoin. It is much used, in combination with ammonia, by the scientific chemist, as a means of effecting the separation of iron from manganese, cobalt, and other metals.

Benzoin, or Benjamin, is a species of resin used chiefly in perfumery. It is extracted by incision from the stem and branches of the styrax benzoin, which grows in Java, Sumatra, Santa Fé, and in the kingdom of Siam. It enters into numerous preparations, among which may be mentioned fumigating pastiles and fumigating cloves. It is, moreover, sometimes employed, when dissolved in alcohol, for varnishing snuff-boxes and other objects, in order to give to them an agreeable smell when they become heated in the hand or pocket.

Oxalic acid may be prepared by the action of nitric acid on sugar, silk, saw dust, hair, glue, and several other animal and vegetable substances; but for commercial purposes sugar and molasses are alone employed, and yield acid of greater purity than that obtained from any of the other above-mentioned commodities. To make this acid, four parts of nitric acid, of specific gravity 1·40, are added in a large stoneware vessel to one part of raw sugar, and the mixture subsequently heated in a water bath until the whole of the nitrous gas which is at first driven off has become totally disengaged. When this point has been attained the pipkin is removed from the water bath and allowed to cool, by which means the oxalic acid is obtained in a crystallised form, whilst the malic acid generated at the same time remains dissolved in the mother liquors.

Oxalic acid is chiefly used for discharging colours in certain styles of calico printing: it is also employed for whiting the leather of boot-tops, and cleaning straw-bonnets, and other similar fabrics. Nine parts of water at 60° Fahrenheit dissolve one part of oxalic acid, and this solution, if taken into the stomach, rapidly acts as a deadly poison. From the great similarity of appearance which exists between this substance and sulphate of magnesia (Epsom salts), mistakes attended with the most disastrous consequences have not unfrequently occurred; but from the insolubility of oxalate of lime, and its consequent inactivity in the system, all dangerous symptoms may be readily removed by a prompt and cautious use of lime-water.

This acid likewise occurs ready formed in the juice of the wood sorrel, in combination with potash as a binoxalate—a salt which is in Switzerland largely prepared from this source, and sold under the name of salts of sorrel, or salts of lemon. Oxalic acid is much used by the scientific chemist as a means of detecting lime in any solution in which it may exist. For this purpose, the oxalate of ammonia, as being more certain and delicate in its action, is more frequently employed than the free acid. Some extremely beautiful crystals of this salt were exhibited in the case belonging to Mr. Button, which contained numerous other chemical preparations of great beauty and purity.

Among the inorganic crystallised acids we find white arsenic, or arsenious acid. This substance is prepared by sublimation from minerals which contain arsenic in the state of combination with other bodies, such as iron and cobalt. A large portion of the arsenic employed in this country is obtained from the mines of Cornwall, where it is prepared during the "burning" or roasting of the ores of tin. The oxide of tin raised from the mines in that country is always to a greater or less extent associated with arsenical pyrites or mispickle, which, having nearly the same density as the tin ore itself, cannot be separated from it by washing. To eliminate this substance, which, if allowed to remain with the tin ore would materially deteriorate the metal produced, the ore is roasted for a considerable time in reverberating furnaces adapted for that purpose. The arsenious acid which is thus driven off is collected in chambers placed in connexion with the flues of the furnace, whilst the sulphurous acid which is at the same time produced escapes condensation, and

finds its way into the air through the chimney attached to the apparatus. The ore, after being purified, is easily separated by washing from the oxide of iron with which it is contaminated, and the arsenious acid is collected in the flues, but it is considerably soiled by the smoke passing through them, and is therefore purified by a second sublimation. This is done by placing the impure arsenious acid in a pot or retort, where it is again heated to the subliming point, and collected in large receiving chambers, in which it is deposited in a crystalline form. When first deposited, arsenious acid is perfectly transparent, but after a short exposure to the atmosphere it becomes opaque, and assumes the appearance of enamel, in which state it is much less soluble in water than when in the transparent form. This change of molecular structure it found to commence on the surface of the exposed fragments, and gradually to spread through the whole mass, as pieces which are completely whitened on the outside are found to retain their transparency towards the centre of the mass.

Arsenious acid, in combination with other bodies, is extensively used in the arts, and is in some cases administered as a medicine, although, in extremely minute quantities only. It is also occasionally introduced, to a small extent, into the materials of flint glass, either before their fusion, or in the melting-pot itself. When thus employed, it has the property of peroxidising the iron of the sand, and thereby improving the colour of the glass, although if an excess be added, the reverse is found to be the case, and a dull milky cast is imparted to the crystal.

Arsenious acid is, moreover, extensively employed in the manufacture of Scheele's, or emerald, green, which is prepared by adding a solution of arseniate of soda to another of sulphate of copper. The colour thus obtained has a very beautiful tint, and is much used by paper-stainers in the preparation of various kinds of ornamental papers.

Arseniate of potash, which is an acidulous salt, prepared by fusing together arsenious acid and nitre, is sometimes used in calico-printing, for the purpose of preventing certain spots of cotton cloth from receiving the mordant. With this view it is mixed with gum-water and pipe-clay, till it forms a pasty fluid, and is applied with a block to the places on which the mordant is not required to adhere.

Some fine specimens of this substance were exhibited by Mr. T. Garland, of Fairfield, Redruth; and Mr. H. W. Jenkins, of Truro: but they were placed among the mining and metallurgical products of class 1.

Chromic acid, of which specimens were exhibited in this section, is made by the addition of sulphuric acid to a solution of bichromate of potash, which causes a copious deposit of red acicular crystals to be produced. This substance is remarkable for the fine colour of its crystals, but it has not as yet been employed for the purposes of the arts. It is a powerful oxidising agent, and as such is occasionally used by chemists.

CIVIL ENGINEERING MODELS.

STEPHENSON'S BRITANNIA BRIDGE; the model executed by James, of Broadwall, is to a scale; all the parts bear an exact proportion to things as they are and as they were. The bridge consists of two tubes, forming the up and down lines; and each tube was made of four different parts, namely, two land tubes of 230 feet span each, and two centre tubes of 460 feet span; when these had been raised to their proper position on the piers (at a height of 103 feet above high water mark,) they were joined together to form one. The total weight of the two tubes is about 11,000 tons. In the model, one tube is shown complete, stretching across the Straits; and the land tubes having been built on scaffolding in the position they now occupy, the scaffolding is shown. The two central portions of the second tube, illustrate the transits of the tubes from the platforms on which they were built to their ultimate destination on the piers: one tube is shown being floated to the basement of the piers, and the other is shown in the act of being raised by the hydraulic presses.

THE RAILWAY BRIDGE over the Wye, at Chepstow, by Brunel, is a novelty in engineering. It is composed entirely of wrought-iron. One span is 300 feet, and others 100. The principle of construction adopted in spanning the 300 feet seems to be that of an extravagant trellis; the principle of the trellis is of the same character as the Britannia tubes, or any other beams or girders,—that is, the top is subject to compression, and the bottom to extension. This bridge has two lines for the up-and-down trains. The span of 300 feet consists of two huge trussed girders, the bottom of each composed of two single wrought-iron beams, which resist extension, and between which one of the lines runs; these beams being formed of boiler plate, riveted together. These two girders are supported at two points, 100 feet apart from each end, from a wrought-iron tube above, which stretches across the whole span, and this tube resists the compression. This tube also has been raised at a considerable elevation above the bottom girders, so that the weights, such as trains, &c., passing along the line, may be properly resolved or distributed over the tube by means of the tie-rods and stays; the 100 feet spans being crossed simply by wrought-iron beams.

THE WROUGHT-IRON BAR-CHAIN SUSPENSION BRIDGE, at Kieff, in Russia, across the Dnieper, by Vignoles, is the most extensive work of the kind ever attempted, being half a mile in length. This bridge has four principal openings, of 440 feet each, and two side openings of 225 feet. On the right bank of the river is a Swivel Bridge, which gives a free opening of 50 feet for the passage of boats, &c. There is a great advantage in the suspension principle when the chains cannot be moved from shore to shore, as in this case, an island of masonry having to be formed in the river as a resting abutment, to allow of the free passage for boats at the other side; there are, therefore, three abutments—two for the chain, and one for the swivel bridge, and five piers; all these require coffer-dams of unusual size, particularly for the abutments. The chains are composed of best flat links, 12 feet long, and weigh about 4 cwt each. The tie rods, which hang from the chains on each side, are 2 inches in diameter, and are immediately connected to the girders which support the platform. The platform is the chief novelty; and consists in a judicious combination of iron and wood, light and stiff. The trussed girders are mostly of wood, and are deeper than the tension girders, which latter are rendered rigid by tension bars. One set of chains supports the trussed girders, and the other set supports the tension girders and these occur alternately; the additional depth of the trussed girders being for the double purpose of stiffening the platform, and supporting the footpaths outside the chains. The trussed girders are connected underneath at each end by longitudinal ties, which run the whole length: the balustrades separate the carriage-way from the footpaths; and they act conjointly with the ties underneath in checking any tendencies to undulation. the girders are also braced diagonally to prevent side-play. The model is executed by Mr. James. The whole of the machinery and iron used in the construction of the Kieff bridge was made in England, and weighs about 3300 tons; nine steam engines are employed, varying from eight to fifty horses power, in pumping, driving piles, grinding mortar, hoisting timber, &c. The cost of the bridge, when finished, is estimated at 400,000*l*.

STEPHENSON'S HIGH-LEVEL BRIDGE, at Newcastle-upon-Tyne, was also exhibited in model, by Hawks and Co., who were contractors for the iron-work. The banks of the Tyne, both at Newcastle and Gate-head, are exceedingly steep, and are connected by a viaduct, 1375 feet in length, running at a height of 112 feet above high water mark. There are six principal openings, each of 126 feet span. The principle of construction is the bow and string: the arches, which form the bow, are of cast-iron, and the rods, which form the strings, are of wrought-iron, to resist tension; there are four arches to each span, two on each side, which bear properly on the piers, through the medium of bed plates, on which the arches rest; and the strings of each arch consist of two wrought iron rods, keyed to the arches at the abutments. Cast-iron columns connected to the arches support a platform above, on which three sets of rails are laid, and they also support another platform below for a carriage-road, the footpaths running between the two arches on each side; this road, in fact, runs along the strings, but has no connexion with them; the arches take the whole weight of both platforms above and below, leaving the strings independent, to resist only the tension. The iron-work required the adjustment of an immense number of parts; yet no joints, and hardly any fastenings, are to be seen; in fact, it is difficult to make out how it has been put together.

OUSE-BURN VIADUCT.—Amongst other objects of interest exhibited by B. Green, of Newcastle-on-Tyne, was a model of the central arch of the Ouse-burn viaduct, on the Newcastle and North Shields railway; the arches are of timber, built up of layers or planks sufficiently thin to allow being bent to the required sweep. The arch having thus been built up to the required size, is bound together by iron straps, bolts, &c. It is then scientifically strutted, to resist and distribute the thrust properly.

SALTER'S MODEL OF THE GREAT OPENING BRIDGE AT SELBY, on the Hull and Selby Railway, was exhibited, and is of novel character, on account of its large span. The River Ouse is at all times rapid, and particularly so during the frequent freshes; it required, therefore, that a peculiar construction should be resorted to; and, by the Act of Parliament, it was stipulated that the bridge at Selby should have an opening arch of 44 feet span for the sea-borne vessels trading to York. Messrs. Walker and Burges were engineers for the railway; the bridge was likewise executed under their direction; the contract for the iron-work being undertaken by the Butterly Iron Company. The river, at the point of crossing, is about 200 feet in width, and at low water 14 feet in depth; the tide rising 9 feet at springs, and 4 feet at neaps. The bed of the river consists of silt, resting on a thin bed of sand, beneath which is clay of a hard quality. The land abutments are constructed of brickwork and masonry, resting on piles. The intermediate piers for the support of the superstructure are formed of open pile-work, the piles being driven 15 feet into the solid clay, and their tops surmounted with cap sills, of large scantling, upon which the iron-work is bedded. To give additional stiffness to the two centre piers, a novel plan was resorted to in the bracing by rounding the centre piles for a portion of their length, so as to allow the cast-iron sockets to descend and take a solid bearing on the square shoulders of the piles, to which were connected the long timber braces; so that when the sockets, with the braces attached, were let down to their bearings, the tops of these braces were brought to their places at once, and secured to the cap sills. The superstructure is of cast-iron, consisting of six ribs in the width of the bridge. The opening arch is formed of two leaves each, worked upon a centre carriage, with tail pieces acting as counter-balances for assisting the opening and shutting when necessary. This is accomplished by an iron segment of nine-feet radius firmly fixed upon the main shaft, and worked by a system of wheels, so arranged that one man can raise or lower either leaf of the bridge in fifty or sixty seconds. A double line of railway is laid

along the bridge on continuous timber bearers. To provide for the effects caused by changes of temperature on the iron-work of the bridge, wedge-shaped iron keys, fitting into proper grooves at the junction of the two leaves of the opening part of the bridge, are inserted to such a depth as to give the necessary bearing. The extreme variation of the width of the opening from the above cause is found to be about three-quarters of an inch. The entire weight of cast and wrought-iron is equal to about 600 tons, and the weight of each leaf of the opening span rather more than 90 tons.

STATIC BRIDGE.—This model was exhibited by the inventor, Mr. Sankey, who, to add increased strength to all bridges on the principle of the arch, whether of stone, brick, or other material, proposes to cut the voussoirs in such a manner as to add them a wedge-shape *both* in their *vertical* and *horizontal* planes, so that each voussoir shall become the integral or component part of two arches, viz.: the vertical, or that which spans the road, river, &c., intended to be crossed, and a *horizontal* arch bounding one side of the roadway. Now, if the voussoirs on both faces of the bridge be so cut, it followes that there may be two horizontal arches, each having the direction of its thrust opposed to the other; in fact, substituting portions of a cone, or portions of a cone and cylinder, for the common cylindrical arch; and if the spaces between these two horizontal arches are well keyed in by beaders, running continuously through the entire width of the bridge, or, where hollow spandrils are deemed requisite, by means of cross walls, &c., any force, such as a mountain torrent, a very strong wind, or a heavy body striking against the side of the bridge, would be resisted by the convex arch on the other side; and the concave arch, against which such force must first impinge, would retain its position unaltered, provided the abutments be solidly and judiciously constructed. Were a bridge built on this principle, with abutments so formed as to counteract the thrust of these side arches, any lateral pressure that might be exerted against it would only tend to wedge the convex arch on the opposite side more closely together; or rather, these arches, having been well keyed in the first instance, would undergo no change whatever; a very valuable condition for bridges thrown over rivers subject to floods, or other sudden causes of side pressure, which so often carry away bridges built in the ordinary manner.

SHIELDS'S MODELS OF BRIDGES, ETC., FROM NEW SOUTH WALES, were exhibited in the Colonial Department. These engineering contrivances are especially suitable for New South Wales, where, the cost of iron-work being very considerable, the engineer has to economise to the utmost extent the use of this valuable material, and in cases where practicable to dispense with it altogether. Mr. Shields's model of a "lattice bridge," and also that of a "railway trestle frame," are of the latter character; and are, therefore, suitable for many other parts of the world—New Zealand, for instance, which abounds with valuable timber, suitable for bridges and similar works. The American engineers have long paid considerable attention to the best disposition of timbers in the construction of their bridges and extensive railway viaducts; and these have been followed, to some extent, both in the railways of England and Ireland.

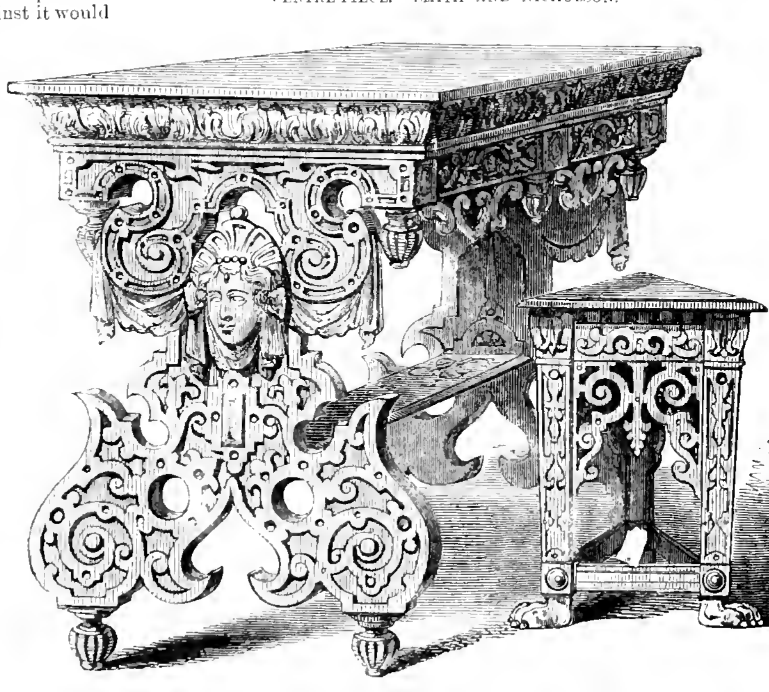
Mr. Shields's lattice bridge is of round timber, thus getting rid of much expense in the shape of labour, and also in the entire absence of iron fastenings. The model consists of three lines of vertical round timbers, properly notched, and having two perforations to receive the horizontal timbers. Between each pair of vertical timbers are two diagonal pieces, resting at bottom on cross-timbers, and framed into the vertical timbers at top. There are three double sets of horizontal timbers, the upper ones supporting the joists placed transversely, and to which the floor-boards are secured. These joists project on either side of the bridge, in order to gain additional width of roadway; a wooden railing, properly strutted, completing the whole. The "railway trestle frame" is intended specially as a substitute for embankments, in countries where labour is dear and timber plentiful. The framing is similar to that of the lattice bridge.

A third model shows Mr. Shields's economical method of laying the rails in New South Wales, which is the same as that adopted in the north of England, and to a great extent in America; but the peculiar mode of placing the rails, and securing them to the timbers, are the novel parts of the design.

Captain Moorsom was the first engineer in our country to introduce the railway lattice bridge from America: this he first effected on the railway between Birmingham and Gloucester; and he has since erected, over the Norr, in Ireland, a handsome bridge on this plan, a model of which was exhibited, as also a model of his design for the proposed bridge over the Rhine, which gained for him the second prize.

LEATHER'S SUSPENSION AQUEDUCT over the Calder was exhibited in model. This fine work carries over the river Calder the canal, which is navigable for sea-going vessels of 7 feet draught of water, and 120 tons burthen. The tank or trough is 9 feet deep, and 24 feet wide within, and contains, between the points resting upon the abutments, 940 tons of water, being more than is held in the 19 arches of the Pont-y-Csyllte aqueduct in Wales. On each side of the Calder aqueduct is a towing-path; a Grecian-Doric colonnade masks the sides of the tank, with a portico and pediment at each end, the suspending-rods passing through the columns to the ends

CENTRE-PIECE.—SMITH AND NICHOLSON.



ELIZABETHAN FURNITURE.—RICHARDSON.

of the transverse bars, concealed by steps. The span of the suspending arc is 155 feet; weight of each, 101 tons; width between the suspending-rods, 30½ feet; diameter, 2¼ inches; total weight supported by arcs, including their own weight, 1700 tons. There was also exhibited a model of *Leather's Cast-Iron Bridge over the Aire* (arch, 120 feet span), remarkable for its architectural beauty, though strictly an engineering work.

Suspension Piers.—Captain Sir Samuel Brown, the inventor of the Chain Bridge, exhibited a model of the Brighton Suspension Pier, one of the first of the kind executed, and which has led to the adoption of this pleasing form of pier and bridge by many of the first engineers of Europe, in cases where the traffic is not of a ponderous character. The fairy-like structure of the great Telford over the Menai Straits serves as an illustration; for, so soon as the heavy traffic of the Holyhead Railway was anticipated, a new bridge of great strength was designed and carried into execution by Mr. R. Stephenson; while the lighter traffic of the Holyhead road is still carried over the original structure.

SIDEBOARD.

BY JOHNSON AND JEANES.

The mahogany sideboard exhibited by Messrs. Johnson and Jeanes, of Bond-street, is a very handsome production, of admirable workmanship. The supports are boys, with grapes, &c., resting respectively upon a lion and a tiger. The mouldings along the edges are very bold, and carefully finished.

CENTRE PIECE.

BY SMITH AND NICHOLSON.

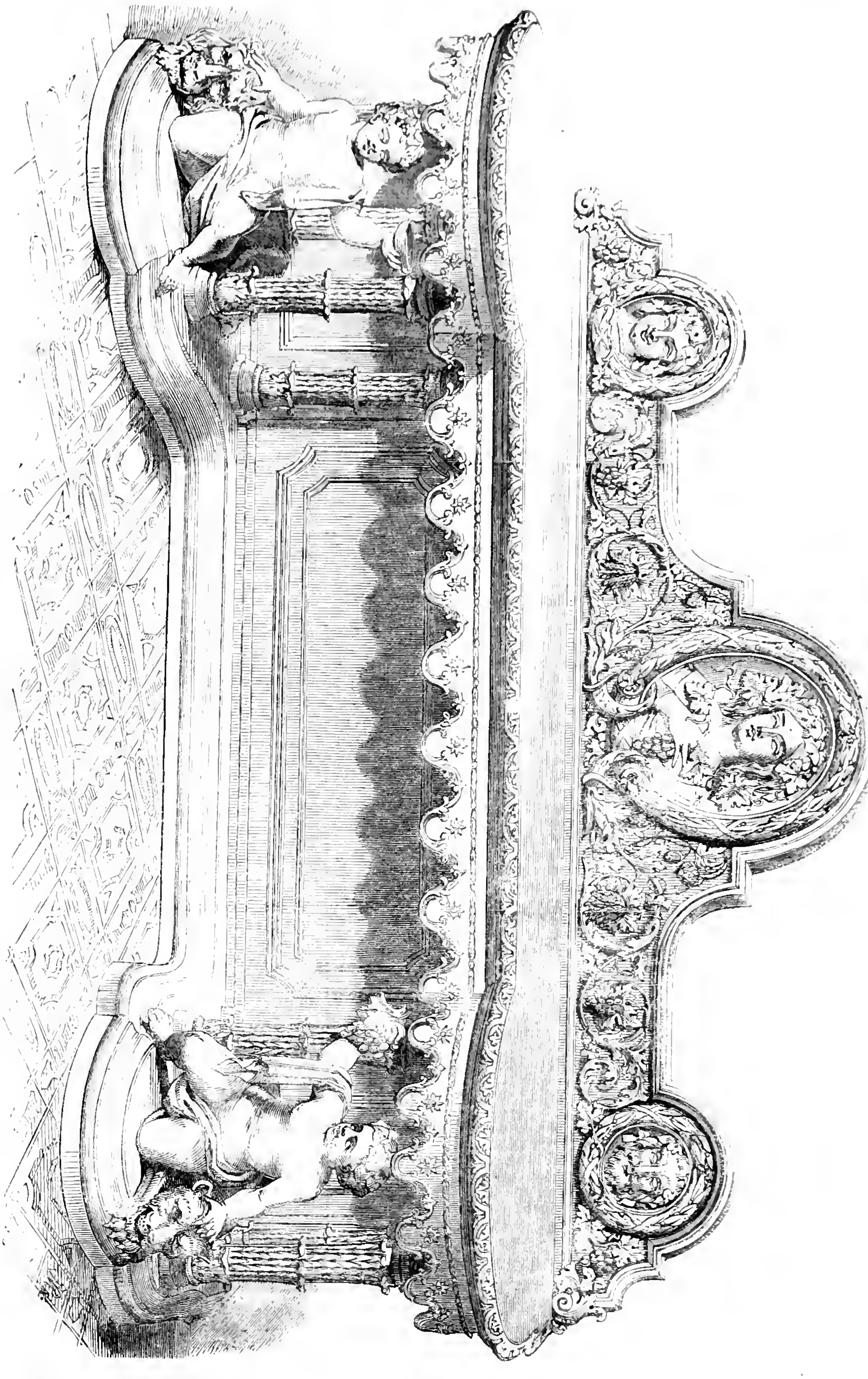
This is a very fine piece of workmanship. The design represents ancient Britons seated under an oak.

ELIZABETHAN FURNITURE.

BY RICHARDSON.

Quaint in character, these pieces of furniture were admirably executed, and carved in British oak.

SIDEBOARD.—JOHNSON AND JEANES.



TEXTILE MANUFACTURES.

CALICO-PRINTING MACHINERY.

FIGURED patterns were formerly printed on white cotton cloth by means of wooden blocks cut after a fashion similar to those used at present for wood engravings. These blocks being smeared with a colouring matter, were pressed upon the cotton cloth by hand; and when patterns of more than one colour were produced, different blocks, carrying the figures corresponding with the different colours, were successively applied to the same cloth. This hand-labour gave way to the invention of a system of Calico-Printing Machinery, by means of engraved copper rollers, of which numerous specimens were shown in the Exhibition. By one machine constructed upon this principle, calico can be printed in eight colours at once, and dried and finished for consumption; and another claims a still greater power in reference to the combination and variety of colours. Although these machines are very complicated, even with one under our eyes, their general principle may be rendered intelligible. The patterns on printed calicoes and similar figured cloths are formed by a continual repetition of the same figure, which, so far as it consists of a single colour, is engraved upon a copper roller, the length of which corresponds with the breadth of the calico, and the circumference of which corresponds with the length of the pattern. Generally, the breadth of the pattern is repeated many times in the width: it is, therefore, engraved upon the surface of the roller, the length extending completely round it, and being repeated throughout the length of the roller in the same manner as it is intended to appear on the cloth. This roller receives the colouring matter by a certain apparatus which first smears, and then wipes it, so as to remove all dye except what fills the incisions of the engraving. The cloth is then passed between this roller and another which has a soft surface; when the two being pressed severely together, the colour deposited in the lines of the engraved roller is transferred to the cloth, and the printing is completed. For printing patterns in two colours, a second engraved roller is provided, carrying upon it the pattern corresponding to the second colour; and the cloth, after having been printed with the first colour, is made to pass in contact with this second roller, so that the pattern of the second colour is transferred to the cloth from the roller in the same manner as that of the first; whilst the movement of the cloth is so nicely regulated that the pattern of the second colour falls precisely into its place. Where patterns of three colours are to be printed, a third roller is in like manner provided and worked.

Until lately, calico has not been printed by these means in more than four colours; a fifth colour, however, has been added, but by a different, slower, and more expensive expedient. In a machine, however, sent to the Exhibition by Messrs. Mather, the means of printing in eight colours by a single operation, and afterwards drying the cloth, are provided.

But the most admirable part of this machinery is the method by which the copper rollers on which the patterns are delineated are engraved. This, by ordinary tool-engraving, would be very expensive; and the engraved copper rollers would be rapidly worn by the printing. The cost has, accordingly, been evaded by the following beautiful and ingenious mode of producing these engraved rollers at a trifling expense:—

Suppose that the length of the pattern, and consequently the circumference of the roller on which it is to be engraved, is six inches. A small soft steel roller is taken, whose circumference is six inches, and whose length is equal to the width of the pattern. Upon the surface of this roller, the proposed pattern is engraved, and the surface is hardened by a certain process: it is next placed by a powerful press, in contact with another roller of soft steel, and the one roller being rolled upon the other, the surface of the soft roller takes *in relief* an exact impression of the *intaglio* pattern engraved upon the original roller. The second roller, with the pattern in relief, is then hardened, and is rolled by a powerful press, upon the copper cylinder to be engraved, and leaves upon it the engraved characters. These rollers being repeatedly applied to the copper cylinder throughout its entire length, the engraved pattern is reproduced in the same manner as it is intended to be printed upon the cloth.

It is evident that when a pattern has been once engraved in the manner above described upon a soft steel roller, afterwards hardened, the engraving may be multiplied indefinitely; for the first roller may transfer it in relief to a second; and that being hardened may again transfer it in *intaglio* to a third, which may produce another in relief, and so on. A pattern, therefore, however complicated, elaborate, and costly, being once engraved, may thus be literally perpetuated; and the expense of the first artistic labour applied to the original roller, being spread over the unlimited multitude of rollers which may be made from it, becomes insignificant.

A single calico-printing machine worked by engraved rollers, as above described, driven by steam or water power, and attended by a man to superintend them, and a boy to feed the colour troughs, is capable of producing as much calico per hour printed in four colours as would require the labour of two hundred men to produce by the old method of block-printing. And the economy of labour is, of course, still more surprising, when a machine for printing in a greater number of colours is used.

BRICKS, AND BUILDING CONTRIVANCES.

BRICK MAKING MACHINES.—Messrs. Randell and Saunders exhibited a brick machine, with double screw-press and perpetual cutter, for making patent draining sewerage bricks. The machine occupies a space 12 feet by 4, and can be placed under the plug-mill, or the clay may be otherwise thrown into it, to fall on two screws working into one another, driving the clay out at the further end of the cylinder, and giving it in its transit great compression, so that the bricks are delivered through the dies firm and solid. They then pass under a perpetual cutter, which works without checking the progress of the clay, severing the bricks or tiles at any required lengths, giving the ware joints either square, angular, circular, or any segment of a circle, plain joints, or tongues and grooves. Two men and one lad, with the machine working at little over one-horse power, produce 1000 bricks per hour.

The curious and interesting machinery, invented by Messrs. Bovie, and applied by them to a similar manufacture in France, deserves notice also, as producing an amount of strength, with a small consumption of material and greatly-diminished weight, which, if in any sense economical in the first cost, must have an extraordinary value. These bricks of Messrs. Bovie's manufacture are much larger than those at present used, or those just described, and can be made of considerable length if required. They are extremely strong, and must be very compact and readily dried. They contain several small hollows, and in this respect, and the mode of manufacture, are entirely new.

The hollow bricks sent by the Society for Improving the Condition of the Labouring Classes are considerably larger than the common size, and have one large open hollow in the centre of a recess in the top and bottom for mortar. Bricks thus made, dry very quickly and thoroughly; and are admirably adapted, by their comparative lightness, for various purposes in fireproof buildings, and for party-walls. They are also much cheaper, bulk for bulk, than ordinary bricks.

Other new kinds of bricks were exhibited by Mr. Workman, who has invented and patented a new process for rendering them waterproof at small cost; and by Mr. Haddon, who has manufactured them of a rhomboidal form, ensuring their bonding. There were also a number of ornamental bricks, of which some sent by Lord Lovelace were interesting and ingenious; and others, by Mr. Ambrose, also indicated taste and good material.

Amongst the foreign goods of this kind, were the Austrian bricks and tiles exhibited by the establishment of M. Miesbach. The raw material was not sent with the manufactured article; but, from an authentic account, it appears that one brick and tile factory (the largest of several), belonging to M. Miesbach, and situated close to the city of Vienna, occupies upwards of 250 English acres, on which are drying-sheds 25,000 feet in length, adapted for common bricks; forty-three kilns, capable of burning three millions and a half bricks at a time; and more than 8,300 feet of shed for moulding tiles and ornamental work. The annual make from this single establishment is 65,500,000 of bricks, employing nearly 3000 persons in the manufacture. This is only one of seven large establishments belonging to and worked by the same manufacturer, who employs in all nearly 5000 persons, and sells upwards of 107,000,000 of bricks per annum. The colour and texture of the bricks and tiles are admirable; and the selling price is almost inconceivably low, considering the cost of fuel and the price of labour. M. Miesbach obtained the gold medal—both at the Industrial Exhibition at Vienna, in the year 1845, and at that in Pesth, in 1846—in consideration of the magnitude of these establishments, and the excellent manufacture of all descriptions of bricks. The light yellow and red ornamental bricks are said to be the most excellent productions of the kind since the first manufacture of bricks in Vienna under Drusus and Tiberius (13 years before the birth of Christ).

LEATHER, SHOES, GLOVES, &c.

THE leather manufacture is one of the greatest importance in this kingdom. It has been computed that no fewer than 250,000 persons are supported in one way and another by this branch of industry.

The total quantity of all sorts of leather tanned, tawed, dressed, and curried in Great Britain, may at present be estimated at about 60,000,000lb., which, at 1*s.* 6*d.* per lb., gives 4,500,000*l.* as the value of the leather only. It is generally supposed that the expenditure upon shoes annually may be taken at an average of the whole population at 10*s.* each individual, young and old; which, supposing the population to amount to 18,500,000, would give 9,250,000*l.* for the value of shoes only. The value of saddlery, harness, gloves, &c., has been estimated at about 5,000,000*l.* Such is the importance of this branch of British industry.

Tanning is effected by soaking the skins in a solution of tannic acid or tannin, until a chemical compound of gelatine and tannin is produced.

The hides are brought to the tanner either in a fresh state, when from animals recently slaughtered, or, when imported from other countries, dried or salted, and sometimes both, for the sake of preserving them from decomposition. In the former case the horns are removed, and the hide is scraped to cleanse it from any portion of flesh or fatty matter; but in the latter it is necessary to soften the hides, and bring them as nearly as possible to the fresh state, by steeping them in water and repeated rubbing or beating. After this the hair is removed—sometimes by steeping the hides in a solution of lime in water for several days, and sometimes by suspending them in a *smoke-house*. The hair is carefully removed by a curved knife, and the hides are prepared for the actual tanning by steeping them for a few days in a pit containing a solution of rye or barley flour, or in a very weak menstruum consisting of one part of sulphuric acid mixed with from 500 to 1,000 parts of water. The hides or skins are then placed in the tanning solution, which is generally an infusion of oak bark, or some other vegetable product rich in

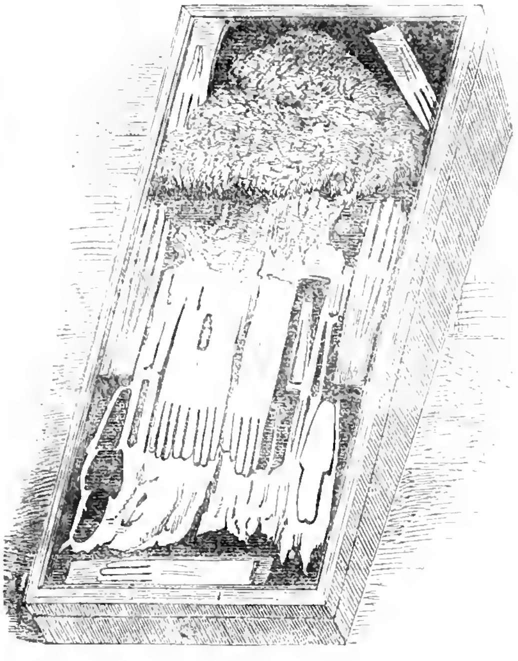
tannic acid. Besides oak bark, which is employed in the greatest quantity, valonia the acorns of the *Quercus ægilops* is brought from the Levant and the Morea. Catechu, or *Terra japonica*, is the inspissated juice of the *Acacia catechu*, and a bean-pod called the *divi-divi*.

Tawing is the name applied to the process by which the skins of sheep, lambs, and kids are converted into soft leather by the action of alum: of this leather gloves are usually made.

Currying is the process of dressing the leather so as to fit it for the purposes of manufacture. Many parts of the process are of exceeding delicacy, requiring much manipulatory skill.

Amongst the varieties of leather exhibited, were morocco, capo, sheep, seal, lamb and kid, ox, buffalo, calf, horse-hide, walrus, chamois, goat, hog-skins, hippopotamus-hide, and rhinoceros.

Mr. E. Whitby, jun., glove-manufacturer, of Yeovil, obtained a prize for "lambskin gloves," usually sold as kid. His case contained an illustration of the process of glove manufacturing, showing the skin in its various stages. One portion of the skin was in the raw state, as imported from Italy; another portion was partly manufactured into leather; another portion was completely made into leather, out of which was cut one pair of ladies' white gloves, and one of the gloves was in a finished state. No portion, from the raw skin to the finished glove, was detached. The Royal Commissioners have done Mr. Whitby the honour of accepting the skin, to be preserved as a specimen of the Exhibition. The glove manufacture of Yeovil is a very extensive industry, upwards of 100,000*l.* per annum being spent in wages alone in the town and neighbourhood.

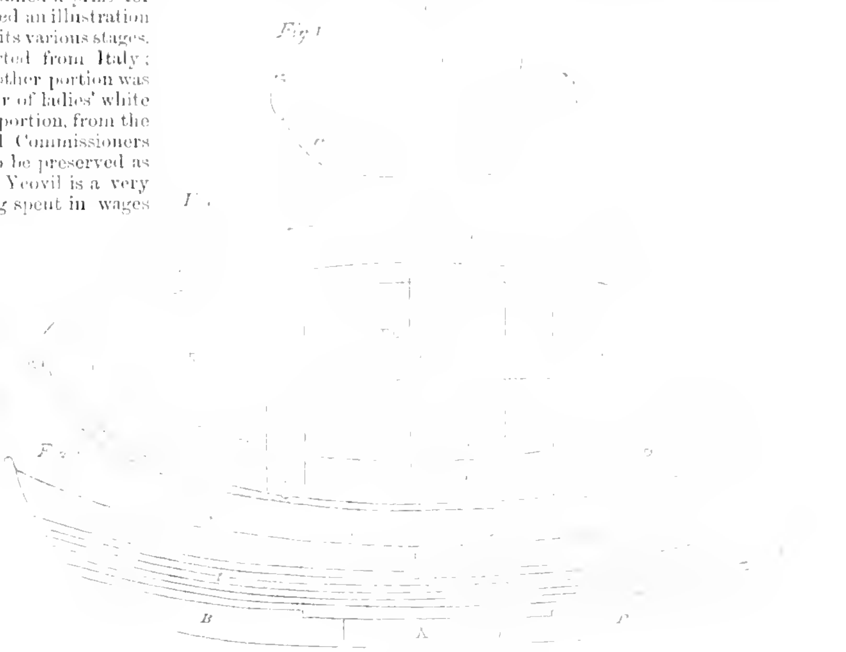


ILLUSTRATIONS OF GLOVE-MAKING.—E. WHITBY, OF YEOVIL.

NAUTICAL DEPARTMENT.

ANDERSON'S LIFE BOAT.

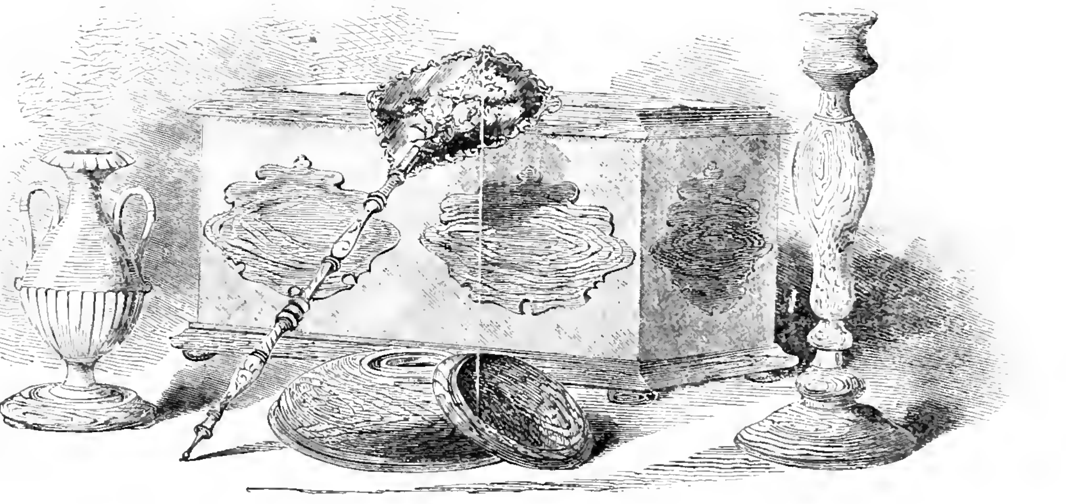
THIS is a pattern of an improved life boat, calculated for either beach service or for passenger vessels and steamers, 16 feet 6 inches long, 6 feet 6 inches broad, and 2 feet deep. Gunwale sheer, 16 inches; curve of keel 7 inches; clinker built, entirely of wood, and copper nailed weighs about 6 cwt. She has an inner, air tight skin or ceiling, upon which all the air and water cases are fitted; she has a well in the centre of her bottom, capable of containing 43 gallons of water, which can be filled with salt water as ballast, or with fresh water when leaving a sinking vessel, by means of valves, which can be opened and shut as required. On each side, and at



the ends of the well, are air-tight cases; diagonal air-cases are also attached to each side, and air-tight seats round each end of the boat, capable of carrying dry provisions, as shown in the drawing. She has sufficient buoyancy to empty herself, with a crew in and the well full, in two minutes, through two tubes in the bottom; and with four tubes she would empty herself in one minute. The water ballast, 435 lb., gives her so great stiffness that she will not upset; and, as she empties herself when filled, there is no danger of her being swamped or sunk. The water ballast has the advantage in beach service that it is no weight to the boat until she is in the water, when the well fills itself. She has been severely tested in heavy broken water, on the head sand at the entrance of the Tyne, with perfect success. Rows four or six oars, double-banked; is fitted up with storm-sails in case of need, and everything necessary for sea service.

ARTICLES IN COTON MACHE.—HART

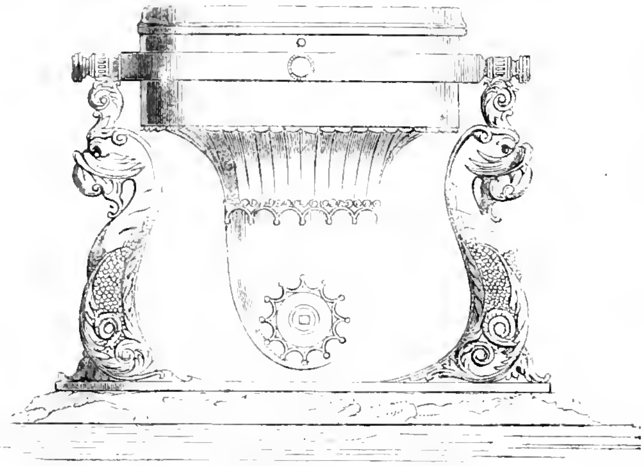
THESE are specimens of a new and interesting manufacture, the invention of Mr. Hart, wherein waste cotton is applied to the construction of articles of furniture, something after the fashion of *papier mâché*. It is equally appplicable to articles of utility and ornament, such as boxes, tables, candlesticks, &c. The surface, by the nature of the material, is susceptible of a grain-like appearance, as is particularly exemplified in the panel of the larger box, which is composed of muslin only.

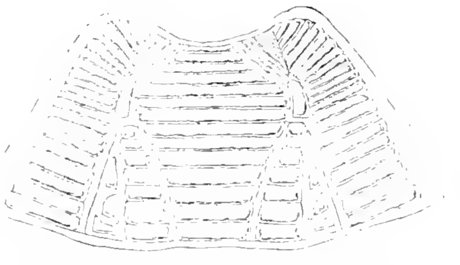


ARTICLES IN COTON MACHÉ.—HART.

REGISTERING COMPASS. BY D. NAPIER AND SON.

This compass registers upon paper the exact course which a vessel has been steered for twenty-four consecutive hours. Its object is to enable the captain at any time to ascertain if the ship has been steered correctly; and, if not, to show the period of error, and the amount of deviation.





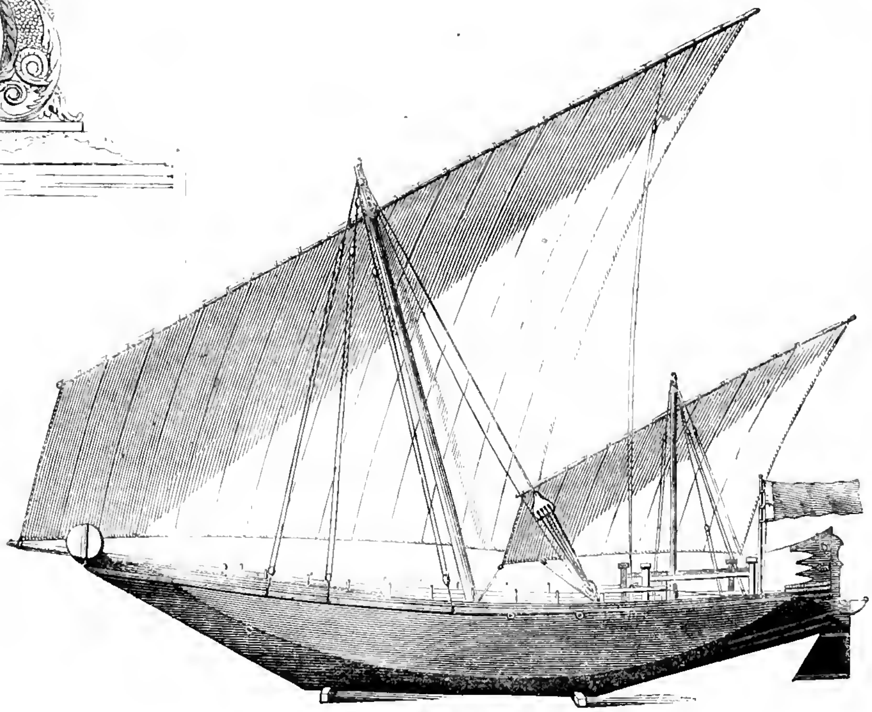
LIFE-PRESERVING JACKET. BY J. D. CAULCHER.

This is one of the many contrivances for the preservation of life in the event of accidental immersion. The ribs are of cork; and it is so fashioned as to be capable of being worn unobserved under a coat or mantle; and, in consequence of its pliability, can be used without inconvenience whilst rowing a boat. When not required, it can be folded up and stowed away in a small space.

MODEL OF AN ARAB BATELLE.

EXHIBITED BY CAPTAIN HAWKINS.

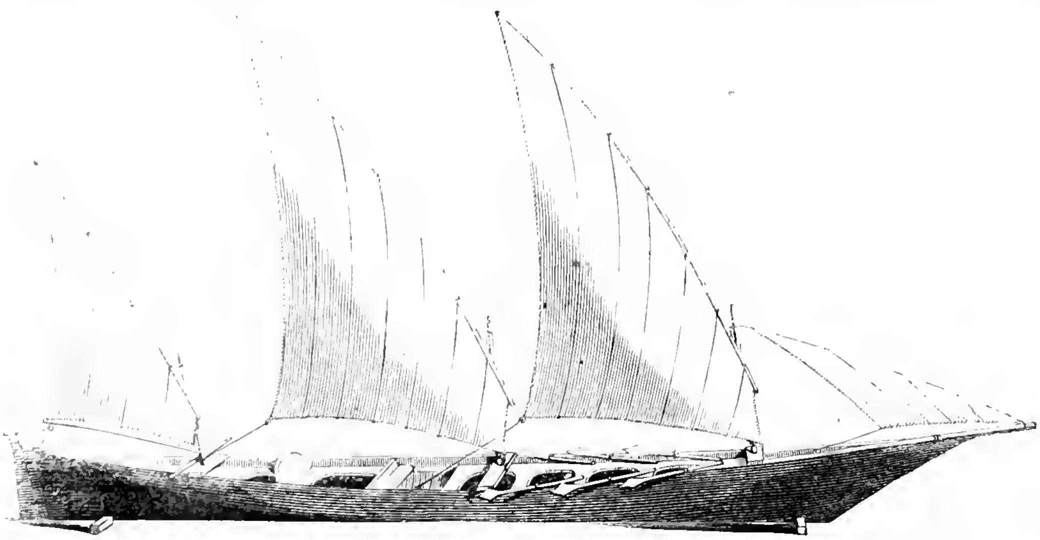
The batelles were the boats principally used by the Joasemo pirates of the Persian Gulf, who were a terror to the native mariners till exterminated by the efforts of the King's ships and the East India Company's vessels of war. These vessels have a very sharp and hollow flow, a very clear run, and a perfect wedge-like entrance, which offers little or no resistance to the water. They are noted for their fast sailing and their weatherly qualities: the consequence was, that to capture them was a very difficult task, and they were frequently known to make off in gallant style when within gun-shot of a ship of war. The Arabs assert that no vessels can sail so close to the wind as the batelle; and, with the exception, perhaps, of the recent case of the *America*, there may be good reason for the assertion; and even the *America*, if put to the test, would be found not to surpass the Arab craft in this quality. The mode of steering the batelle is singular; the rudder projects several feet below the heel of the stern-post; to the after part of the rudder is fixed the tiller, which has a



ARAB BATELLE.

curve pointing upwards; the ropes are led inboard by an out-rigger at the side, by which the helmsman steers. They are lateen-rigged, and have three suits of sails of Bahreen canvas. In calms they are propelled by sweeps. The largest is 150 tons, and only used by the Arab chiefs of the Persian Gulf on state occasions and visits of ceremony. The model is from Captain Hawkins, I. N., and intended as a present to the Court of Directors for their Museum.

The Sampang is a swift boat, used in the Indian Archipelago, and is propelled by sails and oars.

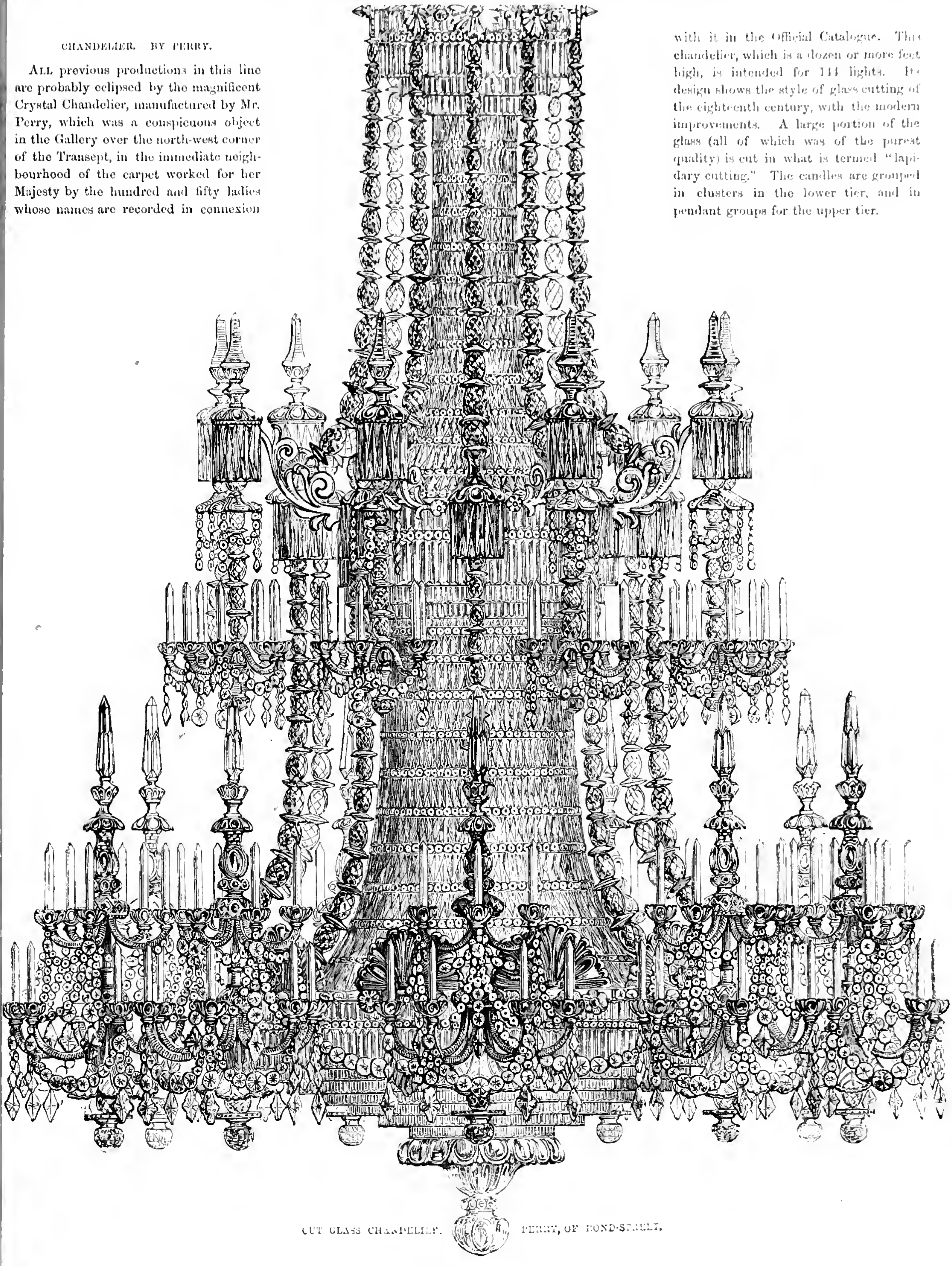


MODEL OF A SAMPANG, FROM THE INDIAN ARCHIPELAGO.

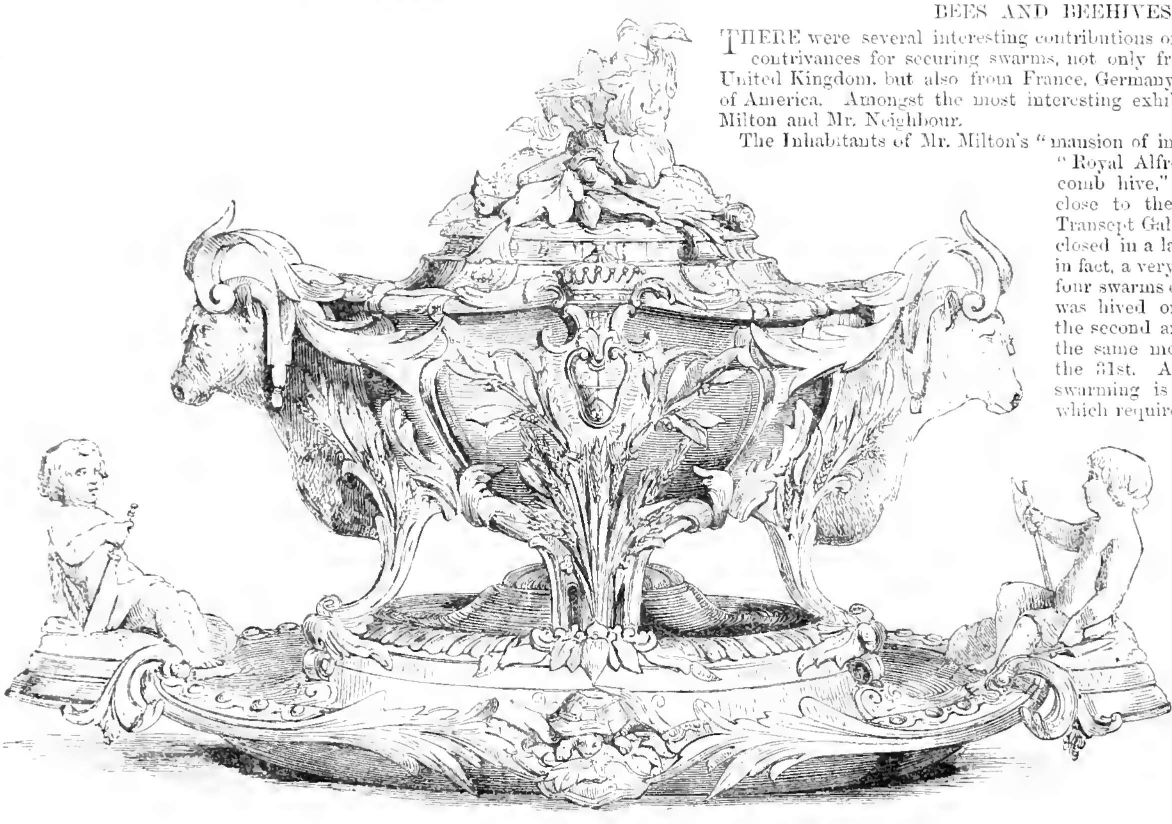
Judkin's Sewing Machine sews in a circle, curve, or straight line, 500 stitches per minute; the rack in which the cloth is placed being moved forward by a spring, at a given distance for every stitch. There are two threads—one is carried in the shuttle, the other taken from a reel at the top of the machine, and passed through the cloth by the needle, and, when withdrawn, both threads are locked in a lasting stitch.

CHANDELIER. BY PERRY.

All previous productions in this line are probably eclipsed by the magnificent Crystal Chandelier, manufactured by Mr. Perry, which was a conspicuous object in the Gallery over the north-west corner of the Transept, in the immediate neighbourhood of the carpet worked for her Majesty by the hundred and fifty ladies whose names are recorded in connexion with it in the Official Catalogue. This chandelier, which is a dozen or more feet high, is intended for 144 lights. Its design shows the style of glass cutting of the eighteenth century, with the modern improvements. A large portion of the glass (all of which was of the purest quality) is cut in what is termed "lapidary cutting." The candles are grouped in clusters in the lower tier, and in pendant groups for the upper tier.



CUT GLASS CHANDELIER. PERRY, OF BOND-STREET.



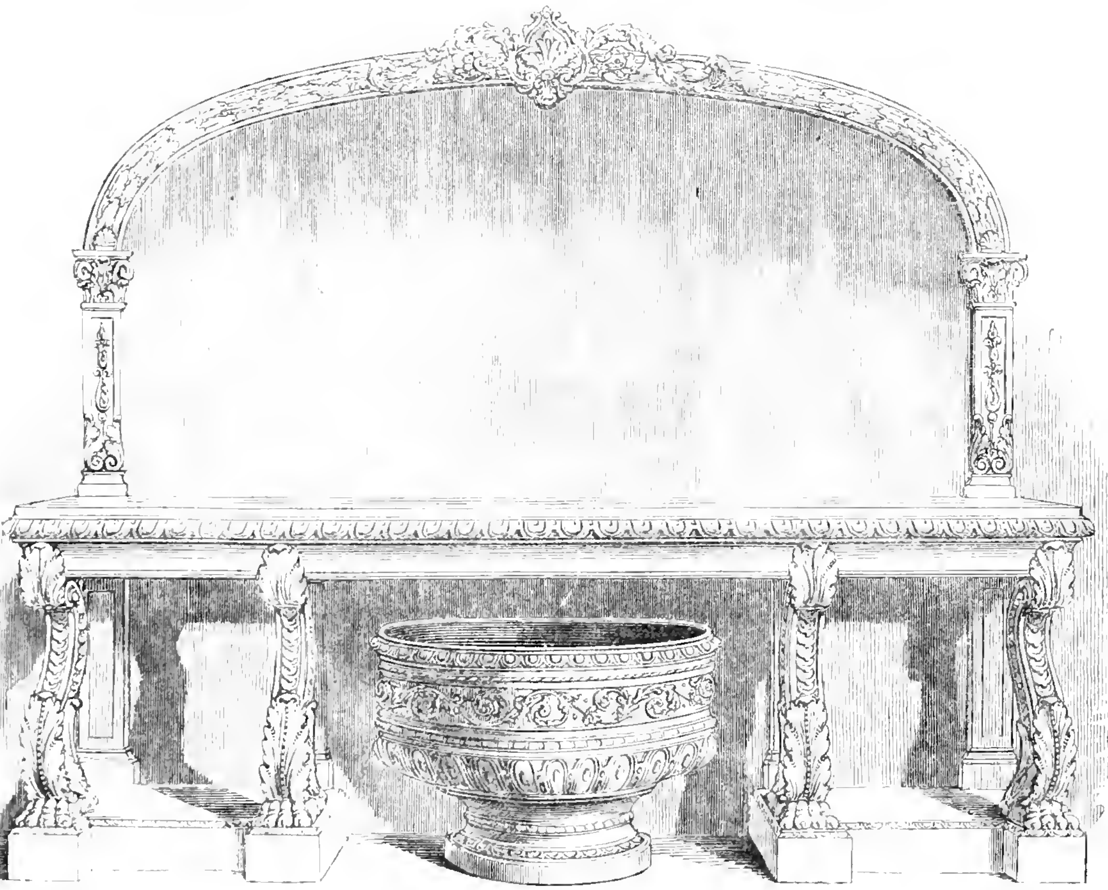
SILVER SOUP TUREEN.—ODIOT.

BEES AND BEEHIVES.

THERE were several interesting contributions of Bees and Beehives, and contrivances for securing swarms, not only from various parts of the United Kingdom, but also from France, Germany, and the United States of America. Amongst the most interesting exhibited, were those of Mr. Milton and Mr. Neighbour.

The Inhabitants of Mr. Milton's "mansion of industry," which, with his "Royal Alfred hive," and the "unicomb hive," occupied a large space close to the "wall" of the North Transept Gallery, the whole being enclosed in a large glass case, forming, in fact, a very fine apiary, consisted of four swarms of bees, the first of which was hived on the 20th July, 1850; the second and third on the 23rd of the same month, and the fourth on the 31st. As hiving the bees after swarming is one of the operations which requires the greatest care and attention on the part of the bee-keeper, it may be as well to mention the mode adopted by Mr. Milton of successfully hiving the four swarms of bees within a few days of each other, and uniting the whole together "without any trouble or fighting about queens."—this immense population, amounting, according to Mr. Milton, to 200,000 strong, continuing to work harmoniously together, after a residence of nearly four months in their apparently close quarters. The first of these swarms came out about three o'clock on the 20th July, as above, and was immediately secured or hived in a wooden box, which was left in a shady place until eight o'clock in the evening, when it was removed to its intended position. The two swarms which came out on the 23rd July were each hived in a common straw hive, and at eight o'clock at night a cloth was spread on the ground near to the box-hive, a brick being placed on the cloth, on which to rest one of the sides of the box, for the purpose of admitting the bees into the box. After being tumbled altogether into the cloth by a smart rap on the brick with one edge of the hive, the other swarm was treated precisely in a similar manner; both swarms were speedily underneath the box, which was left undisturbed till the following morning, when it was put back again to its proper position in the apiary. On the 31st of the same month the same process was performed with the fourth swarm.

Contiguous to Milton's mansion of industry, we find his "Royal Alfred

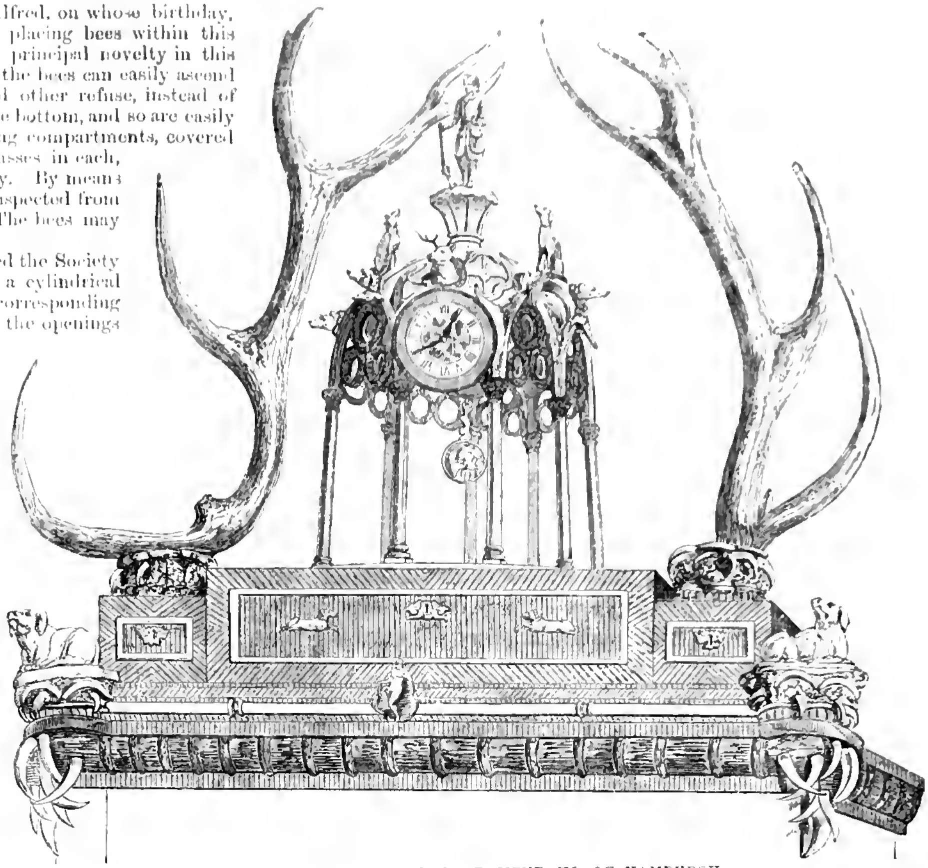


SIDEBOARD.—BANTING.

hive," named after his Royal Highness Prince Alfred, on whose birthday, the 6th of August, 1844, the first experiment of placing bees within this newly-formed hive was successfully made. The principal novelty in this hive appears to be the inclined floors, by which the bees can easily ascend to any part of the hive, and the dead bees and other refuse, instead of remaining, as on level floors, necessarily fall to the bottom, and so are easily removed. There were, on the two upper sloping compartments, covered over with flaps hung with hinges, three bell glasses in each, which will hold altogether about 18 lb. of honey. By means of windows, the whole of the interior can be inspected from time to time, without any risk or annoyance. The bees may be fed either at top or in front.

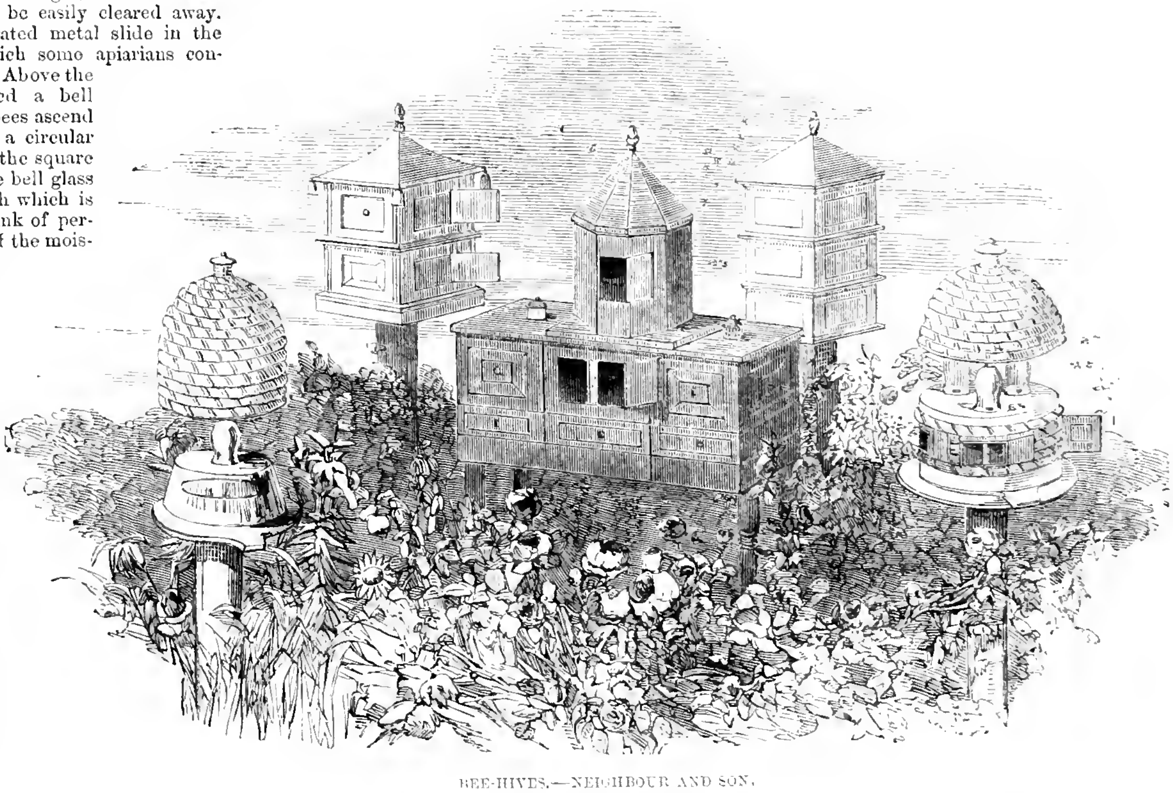
Milton's revolving top hive, for which he received the Society of Arts' silver Ceres medal in 1846, consists of a cylindrical case of straw, covered with two boards having corresponding holes in each, by turning the upper one of which the openings can be closed at pleasure. Bell-shaped glasses are placed on the top above the openings, which, when filled, are readily removed, and fresh glasses substituted. Bees are easily hived by this arrangement, by placing the hive from which they are to be removed on the revolving board, taking care to leave only one opening, and the bees will severally descend into their new habitation without any trouble, the lower hive being prepared for their reception by washing its interior walls with a mixture of sugar and beer, or other suitable sweet liquor.

Mr. Neighbour's apiary consists of a large glass case, with parts of the sides covered with perforated zinc, for the sake of ventilation. This apiary also contains three hives: first, Neighbour's ventilating box-hive, from Mr. Appleyard's apiary, Harrow Weald, containing from 15,000 to 20,000 bees, which were hived on the 30th of April, 1851, the day before that of the opening of the Great Exhibition; Neighbour's observatory glass hive, containing about the same number as the box-hive: and a two-storied square box-hive, with sloping roof. From this latter, the bees decamped within a week after they had been hived, owing to some disturbance, or to the dislike taken by the bees to their new habitation. The ventilating box-hive is square, having windows and shutters. The entrance is at the back, enabling the bees to go to Kensington-gardens, or other resort. In front, at bottom, is a long door hung with hinges, so that all dead bees and refuse may be easily cleared away. By means of a perforated metal slide in the floor, ventilation, which some apiarians contend for, is effected. Above the wooden-box is placed a bell glass, into which the bees ascend to work by means of a circular opening in the top of the square box. In the top of the bell glass is an aperture through which is inserted a tubular trunk of perforated zinc to take off the moisture from within. The observatory hive is of glass, with a superior crystal compartment, an opening being formed between the two. A straw cover is suspended over the upper compartment by a rope over a pulley, which cover is raised up by the attendant at pleasure. The larger or bottom compartment rests on a wooden floor, which has a circular sinking therein to receive the bell glass. A landing-place, projecting, with sunken way, to enable the bees to pass in and out, completes this contrivance.

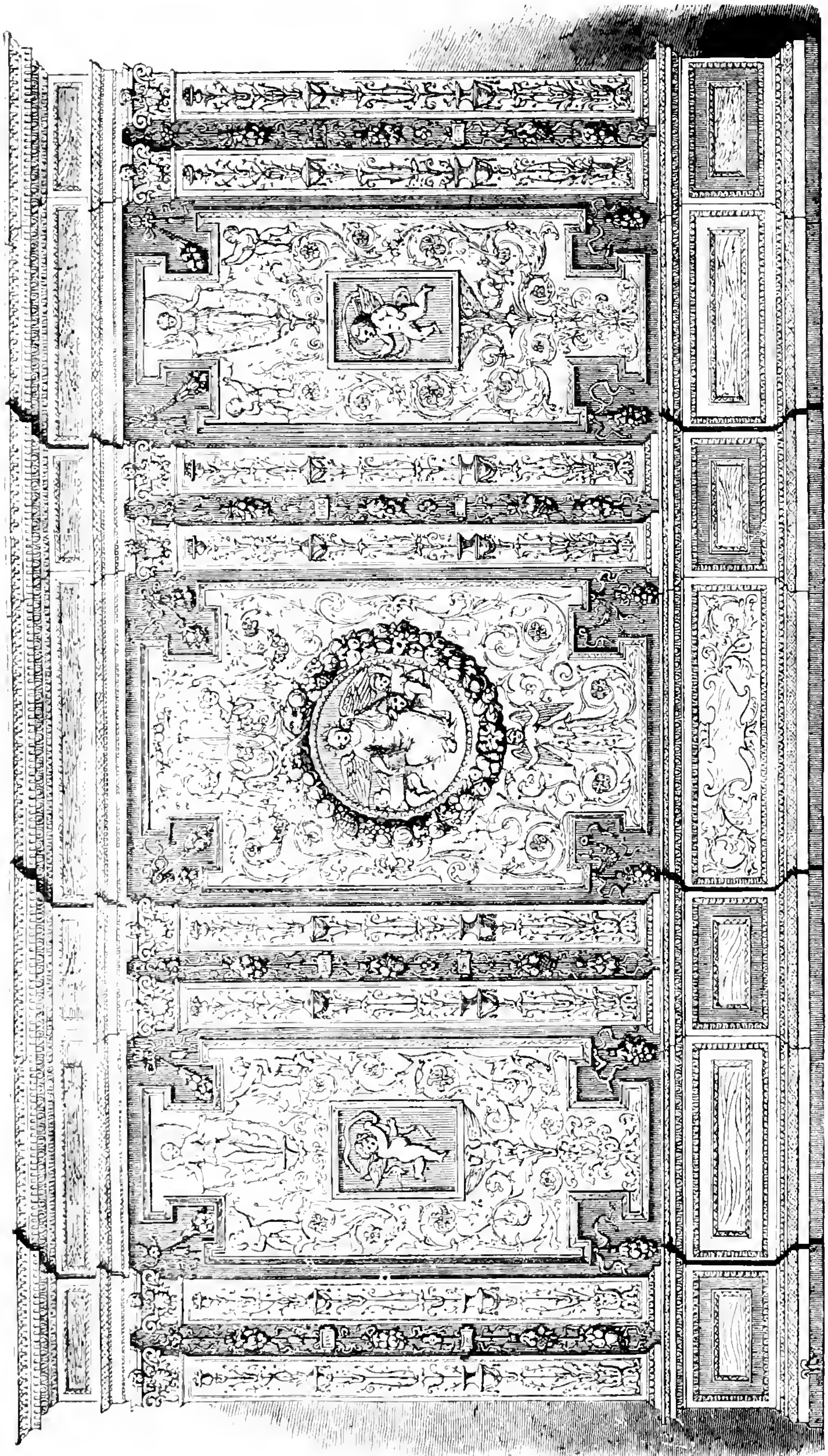


TOP OF WRITING BUREAU.—RAMENDAHL, OF HAMBURGH.

THE Writing Bureau and some other pieces of furniture, by Ramendahl, of Hamburgh, are of characteristic appearance; the materials of decorative horn, and the subjects generally relating to the chase.



BEE-HIVES.—NEIGHBOUR AND SON.



INLAID CABINET, DESIGNED BY GRUNER.

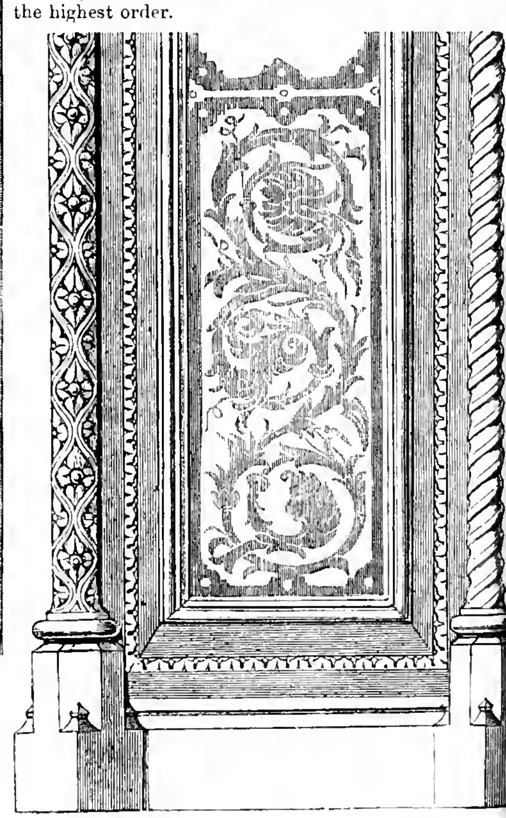
This richly-ornamented Cabinet was a conspicuous object in the Western Nave, where it was much admired. The design is by Gruner, and is very chaste and beautiful. It introduces various coloured woods, the panels being ornamented with marqueterie and carvings; and there are paintings in china after the Raffaelle school in the panels. The whole is finished with richly-gilt mouldings. Altogether we have seldom seen a more elegant production of its kind.

LAMP.—SUPE.

THE design of this lamp, though the materials—little chubby boys—are commonplace enough, is novel and not ungraceful in arrangement.

SILVER SOUP TUREEN.—ODIOT.

THE silver soup tureen, by Odiot, is extremely elaborate, but not very graceful in design; the subject includes a great variety of objects in vegetable and animal life; two ox-heads with horns serving as handles,. The execution and finish, however, are of the highest order.



PANEL OF A STOVE.—JEAKES.

GROUPS, STATUETTES, &c., IN COPELAND'S STATUARY PORCELAIN.

ON this page we engrave five specimens of Copeland's Statuary Porcelain, which are entitled to the highest commendation for design, quality of material, and execution.

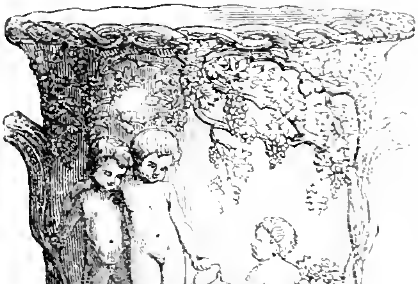
GROUP OF GRACES SUPPORTING A PIERCED BASKET FOR FRUIT OR CUT FLOWERS.

A GROUP—PAUL AND VIRGINIA. BY CUMBERWORTH.

A VASE, BY CELLINI.

THE ELGIN FLOWER VASE.

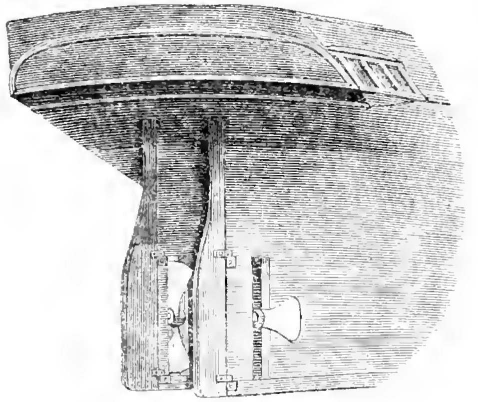
GROUP OF SILVER PLATE. REID AND SONS. (SEE PAGE 423.)



THE VINTAGE GARDEN VASE.

DUPLEX RUDDER AND SCREW-PROPELLER.

THIS invention has just been patented by Captain E. I. Carpenter; and the engravings represent stern and quarter views of a vessel with two rudders and two screw-propellers, fitted in new positions for improved steering and propelling. From the midship section of the vessel to the stem, no alteration is introduced into the form of the hull; but abaft this point they commence. First, the keel, with the dead-wood, stern-post, and rudder, are removed, and the flooring above receives a suitable form for strength. Two additional keels lie in a line parallel with the former keel, but placed at a distance of two or more feet, according to the size of the vessel, on either side of it, terminating at the midship section in the fore-part, and in a line with the former stern-post in the after-part. Framework is carried down to these keels, leaving a free channel for the water to run



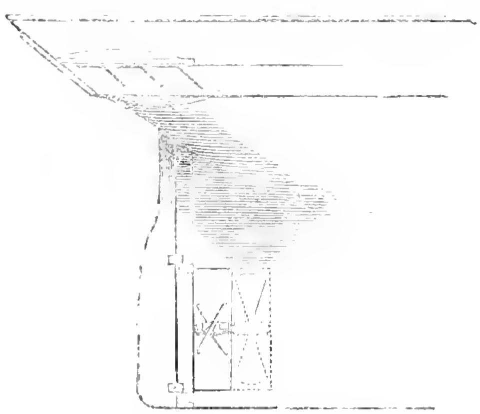
DUPLEX RUDDER AND SCREW PROPELLER.

between them in the direction of the midship keel. A stern-post is placed at the end of the additional keels, and upon each of them hangs a rudder.

A screw-propeller works in an orifice in each framework, on the common arrangement. One of the propellers is a little more aft than the other, to allow full play to both, and yet economise space in the mid channel.

The appearance of the vessel in the water is not altered in the side view, neither is it much changed in the stern view.

The consequence of this new arrangement is, that the rudders and pro-



DUPLEX RUDDER AND SCREW PROPELLER.

pellers are acting with double effect in each case. The rudders are receiving an increased power, because the impact of the water upon them takes place at an angle which is constrained by the situation of the keels, and which is the most favourable that can be had. The two propellers, also, revolving as they are in water confined in a limited space, are working to considerable advantage. The effect actually produced is, that, when required, a vessel can be turned about in nearly half the space that a single rudder can turn it, and the two propellers will give a proportionate increase of speed. Experiments have been made to test the principle in an open space of water, and they can be seen daily on a model at the Royal Polytechnic Institution, Regent street.

The advantages gained by the new construction of the vessel are also considerable. There will be more strength, more bearings in the run, more breadth for cabin room. The rolling and pitching will be reduced very considerably. The vessel will not make lee-way as formerly; the vibration, or tremulous motion, will be lessened. The safety of the vessel will be very much increased, because the duplex rudder will have the effect of instantaneously changing the direction should she be running into some unexpected danger; also, if one rudder should be damaged, the other can be used to steer with. The propellers also can be used separately when required. For river navigation, the advantages obtained by the two rudders and two propellers will jointly enable the screw principle to be applied to steam-boats plying in shallow water, such as the Thames above London Bridge, or to vessels having small draught of water. For transatlantic ships the use of the two rudders and two propellers will jointly ensure their making a passage in less time and at less expense than before, also with more certainty and safety than can be done by a single screw or paddle-wheels.

The duplex rudder is applicable to paddle-wheel as well as screw steam-boats.

ENVELOPE-MAKING MACHINES.

MESSRS. Delarue's Envelope Machine was shown in motion, on the north side of the western nave. In the contrivances for folding, gumming, forwarding, and delivering the envelopes, which were formerly done by hand, the inventor has closely followed several natural movements of the human frame; the cams, especially, exhibiting his thorough knowledge of animal mechanics. First, the lozenge shapes of paper are cut out by a powerful lever machine, with a steel cutter, worked by hand, thus forming at one stroke 480 blanks at once; and a single cutting-machine, worked by one man, cuts a sufficient number of blanks to feed ten folding machines. In that exhibited, two boys were employed; one placing the lozenge-shaped blank on the flat bed of the machine, between four vertical register guiders, at the rate of sixty per minute; the other boy removing the envelopes as finished. In front were seen the *fast* and *loose* pulleys, with a band passing half round the working pulley, and thence below the floor to other pulleys in connexion with one of the steam-engines at work in the Machinery in Motion department. All the chief movements are obtained by means of cams on the principal shaft, which derives its motion from the pulley fixed on one end of it. The cams are five in number, viz., two double, two single, and a large central double cam, which works the double plunger levers, provided with counterpoise balls. The curved plunger, in two parts attached to the levers, is brought down on to the paper at regular intervals; the lower part of the plunger remaining down, while the upper part is drawn upwards. The folders, which turn down the flaps in proper rotation, are worked by the two side cams of the main shaft; and the other double cam of the main shaft gives motion to the taking-off apparatus, or "artificial hand," by which the paper is removed when folded. The two fingers of the hand are small cylinders, fitted at their lower ends with India rubber, which is pressed on to the paper by a spiral spring within, similar to that used in Palmer's candle-lamps; when, the air being excluded by the closeness of the two surfaces, the paper is readily removed.

The envelopes, being transferred by the artificial fingers, are deposited on an incline metallic table, each envelope, as it is finished, being placed in turn at bottom of the pack, by means of two small springs projecting above the table. An endless blanket now conveys the finished envelopes into a metallic case or shield, from which they are taken by the carrier boy.

To the gumming apparatus, motion is given by means of a small shaft, worked by a pulley from the main shaft, in connexion with a segment lever and wheel at one end of the frame. The effect produced by this contrivance is, first, to move an artificial hand on to an endless moving blanket covered with gum, and afterwards to transfer the gum to the proper flaps of the envelope.

Another motion at the top of the frame consists of a segment lever, the teeth of which work into the circular rack or screw, which again works into a small toothed wheel, by which each of the four flaps is made to perform a half revolution, the horizontal circular rack moving first in one direction and then in the other. Eleven of these machines are constantly employed at the manufactory of Messrs. Delarue, in Bunhill-row, by which 396,000 envelopes are completed in a single day of ten hours, averaging 25,000 each machine; more hands are employed by this machine than were formerly occupied in hand-folding at 3000 per day; and only twelve envelopes are spoiled on an average day's work.

REMOND'S MACHINE, also exhibited, differs essentially from that of Delarue; atmospheric pressure being employed for raising singly each sheet of paper, and placing it on the top of the folding apparatus; and, again, in giving the necessary inclination to the flaps of the envelopes previously to their being folded down by the action of the plunger. Several hundred blanks being placed on the feeding table of the machine, by a very simple operation it is started by the girl in attendance. The top sheet is raised from the rest by a "finger," the underside of which is perforated; when, a partial vacuum being formed, each sheet is sucked up against its under surface, and transferred to the folding apparatus, on reaching which, the

exhaustion being no longer maintained, the sheet necessarily drops into its place. The folding apparatus consists of an open box or frame, the size of the required envelope, over which is fixed a creaser or plunger, fitting the inside of the frame. The blank piece of paper having been placed on the top of the box by the feeding finger, the plunger descends just within the box, and the flaps of the envelope are thus bent to a right angle. The bottom of the creasing frame or box is perforated, to prevent any atmospheric resistance on the entrance of the paper, and the passing back of the plunger leaves the paper within the frame, with its four flaps standing upright. At this point, the second atmospheric action gives the flaps of the envelope a preliminary inclination inwards, and fits them for receiving the flat folding pressure of the return stroke of the plunger; to this end, the four sides of the folding box are perforated, so as to allow the streams of air to be forced against the outsides of the flaps of the envelopes, in order that, on the second descent of the plunger, they may all be folded down at once. There are also certain contrivances for embossing the outer flap of the envelope; and for gumming the lowest flap, as a fastening. To compensate for the continual decrease in the height of the pile of blank papers, and to provide for the upper one always coming in close contact with the lifting finger when the platform rises, the addition of a spring has been found amply effective. By this machine, forty envelopes are produced in a minute, which gives as many as 24,000 per day, gummed, embossed, and entirely completed for use; if needed, the velocity might be increased.

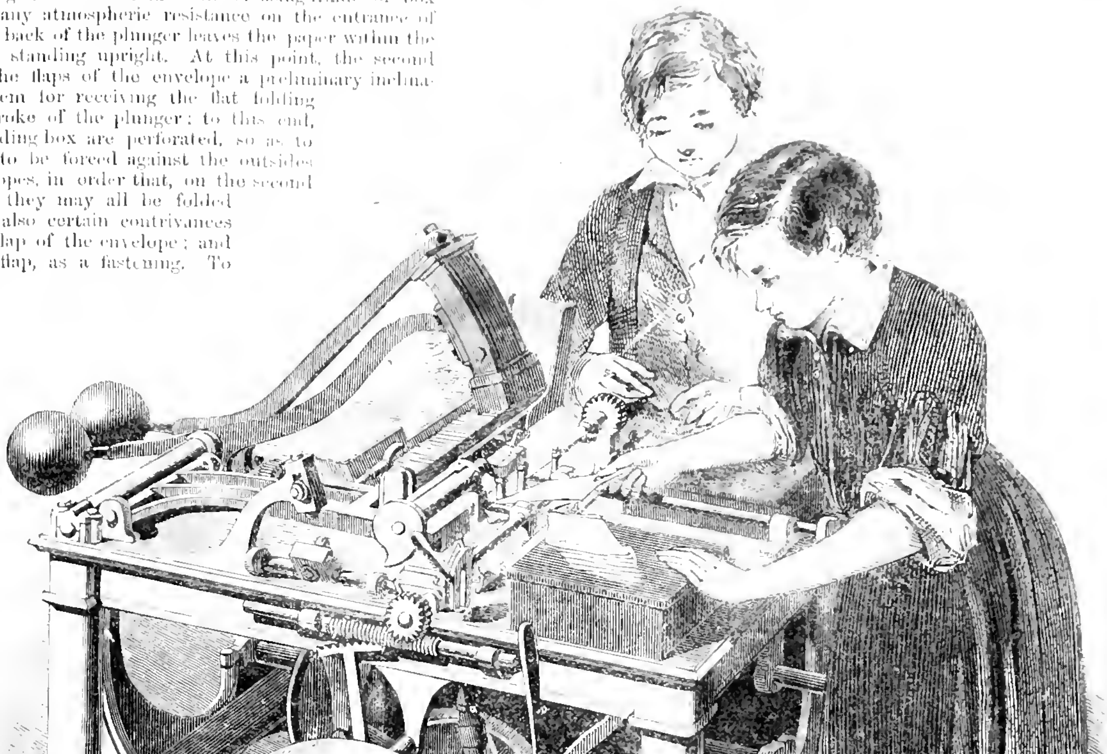
BLACK'S PATENT FOLDING MACHINE was also exhibited, and was much admired for its simplicity and efficiency. It consists of a box or case, with a main shaft, which being caused to rotate by manual or by any other power, gives motion to folding blades and rollers. The newspaper or printed sheet to be folded, is laid upon the table of the machine, with a slit, through which a blade descends upon the sheet, and forces the same at the requisite line of fold. This operation is repeated, accordingly as the blades are set for the sizes, within the machine, which is said to insure perfect register, and to fold 2000 quires of paper, or 18,000 sheets in an hour.

SIDEBOARD. BY BANTING.

THIS very handsome sideboard is made from oak grown in Windsor forest. The form is simple, consisting of a slab resting upon four truss supports, which are richly carved. The plate glass mirror at the back is of large dimensions, and rather unusual in form. The frame has the appearance of lightness combined with sufficient solidity. This production is favoured by the Jury with "honourable mention," as part of "a collection of furniture." It was fairly entitled individually to a prize.

PORCELAIN [illegible] BY LAHOCHE.

LAHOCHE, [illegible] the Palais National [illegible] [illegible] in ormolu [illegible] The [illegible] engraved [illegible] handsome [illegible] and [illegible] The [illegible] upon the frame are painted [illegible] upon a [illegible] foundation.

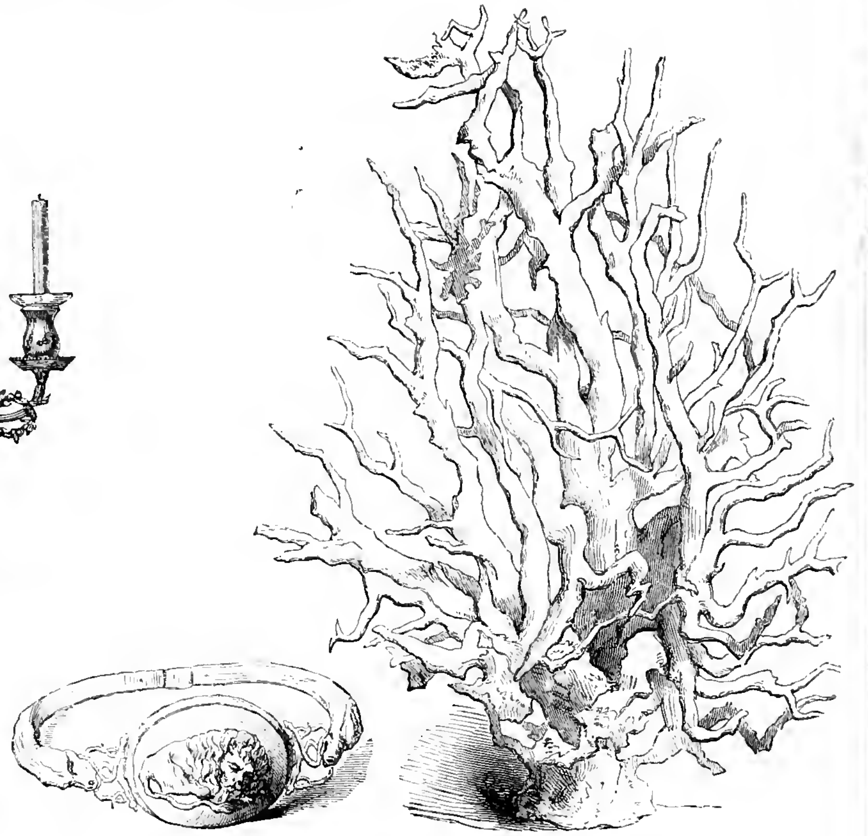


DE LA RUE'S ENVELOPE-MAKING MACHINE.

GROUP OF SILVER PLATE. BY REID AND SONS.

THE articles of silver plate exhibited by Reid and Sons, Newcastle-upon-Tyne, are very tasteful in design and beautifully executed. We observed a coffee-pot and tea service, raised in medallions, and richly engraved in bouquets of flowers, in new shaded grounds; a bread-basket, engraved and pierced, the border composed of three domestic and three wild animals' heads; a basket, richly chased, for bread or fruit (the handle being moveable), with medallions representing the four seasons; a claret-jug, richly chased, with medallions of the four quarters of the globe; an oblong or pincushion dish, with richly ornamented and pierced border, and dome cover, with chased leaves and panels, and handle to suit; an oval dish, with richly ornamented flower border and panelled dome cover, &c.

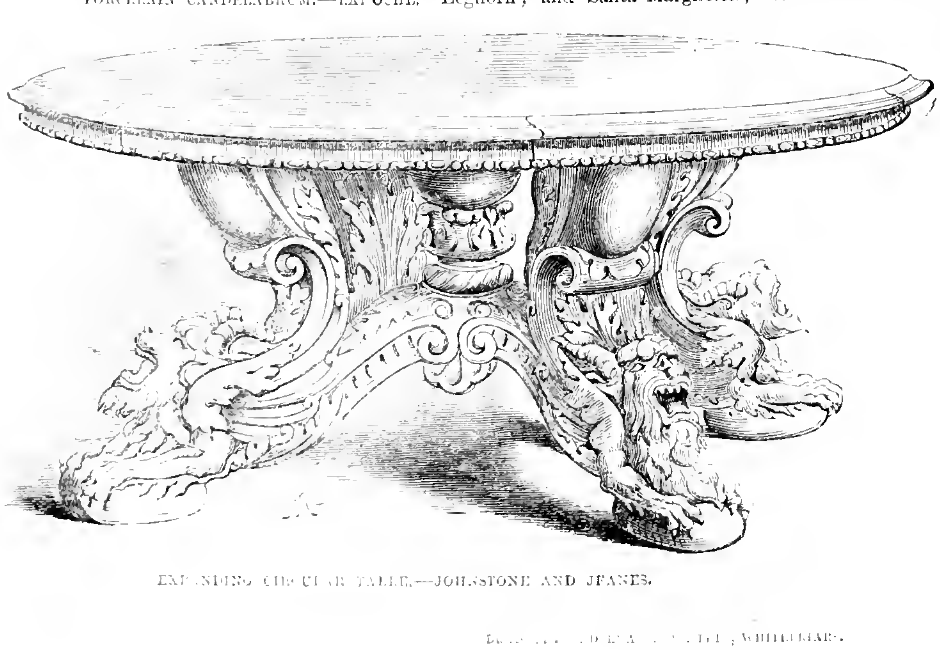
PORCELAIN CANDELABRUM.—LAROCHE.



CORAL RING AND RED CORAL.—PARAVAGNA AND CASELLA.

CORAL ORNAMENTS.—BY PARAVAGNA AND CASELLA.

RED coral has, from time immemorial, been used as an ornamental material in jewellery, in all parts of the world, in beads, brooches, drops, bracelets, charms, studs, and many fancy contrivances. The price varies from 1*s.* per oz. up to 5*l.* and 20*l.* per oz. The best colours are considered a bright red or pale pink: the latter is most scarce. We must not confound with this substance the coral reefs found by mariners, as they are nothing but a spongy white rock, having no analogy whatever with the real red coral. The fishery of the real coral is carried on in the Mediterranean Sea. The largest samples are taken along the Barbary coast, but not the darkest colours. Along the coast of Spain a considerable quantity is taken annually, of a deep red colour, but sometimes rather wormy. The pink and deepest red, but in comparatively small branches, are taken in the Straits of Bonifacio, between Corsica and Sardinia. The amount annually taken varies from 100,000*l.* to 200,000*l.*, the principal stations for the fishing smacks being La Torre del Greco, near Naples; Leghorn; and Santa Margherita, near Genoa. This article is supposed to give employment to from 10,000 to 20,000 hands. The specimens which we engrave in our present sheet are from the establishment of Messrs. Paravagna and Casella, at Genoa, who employ 400 workmen. The principal object is a superb, and for its size almost unique, branch of rough coral in its natural state.



EXPANDING CIRCULAR TABLE.—JOHNSTONE AND JEANES.

EXPANDING CIRCULAR TABLE.

BY JOHNSTONE AND JEANES.

THIS is an extremely ingenious invention (patented), which has received the honour of a prize medal. It is a circular table, which, by means of a very simple arrangement of radiating curved iron bars beneath the top, may be made, by a slight revolution of the surface, to expand to the size required at any moment, extra leaves being provided for insertion between the separated parts. The table exhibited is capable of being arranged to two different sizes, besides the original form; but, of course, the number of changes is optional. The mechanism is so simple, that one pair of hands can adjust it in a couple of minutes, and that apparently with very little exertion. The stand is carved in the Italian style, with grotesque masques.